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Perspectives on the Teaching of Anatomy*

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Some twenty years ago I had an experience which premonitions at the time warned me might be applicable at some later date. That half expected hour has finally struck—this evening.

The experience consisted of observing over a period of about an hour, and with unbounded delight, the behavior of some strange creatures on a dusty road in the state of Paraná, Brazil. As I was riding slowly along a country road in the lassitude of mid-afternoon, I saw what looked like a short piece of rope, perhaps eight inches long and one inch wide, lying in the dust at right angles to the road's direction. But it was moving slowly, and as I came nearer, I reined in my horse and dismounted to look at it more closely.

It was not a single creature but a committee or faculty of about one hundred members—insects, I believe, small feelers, medium sized eyes, stout thoraces, six legs and long, shiny, scaly abdomens which dragged in the dust. Each insect was nearly one inch long. The unusual and highly stimulating feature of their behavior, however, was that they were not all walking. Instead, progress was taking place by means of the following procedure. The eight or ten individuals at the rear end of the group, when they felt their tails or lower abdomens uncomfortably exposed by the absence of others crowding on them from behind, became restless and proceeded to run forward over the backs of their colleagues. Obviously, they arrived, after only about eight inches of such effort, at the forefront of the entire group. In this position, they could apparently determine in what direction the whole group would proceed, but, after one or two rather uncertain essays at variance to the existing axis of the group, each one measured his length in the established direction, wriggled backward slightly until he felt his tail in reassuring contact with his colleagues' most forward looking parts, and, then, in came his feelers, his head was lowered, and he awaited without thought or protest the restless tread of another dozen or so running forward over his back to measure, in turn, their lengths in the direction of progress. As may be imagined, the first dozen or so lying still so patiently found themselves before long at the rear end of the group, where there were no colleagues more backward than themselves,

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and such exposure generated the state of restlessness referred to above, and a repetition of the running forward over their colleagues.

Conversation with entomologists about this very real and instructive experience has enriched my vocabulary, for I find these creatures were positively thigmotactic—i.e., they liked to feel in contact with something on all sides—a preference for snugness—I repeat, *snugness*—and a great restlessness at exposure.

Feeling that reference to this insect at a meeting so distinguished as this would have a merely evanescent or literary flavor unless the creature were scientifically named, I applied last February to the Pan American Taxonomic Union for a definitive name. But ever since the President began calling hitherto undescribed residents of Washington parasites, the Etymological Section of the Entomological Division of the Pan American Taxonomic Union has gotten sadly behind on its publications. So as a matter of necessity, here and now I feel obliged to record that the insect whose conduct has been described will probably be called *Explorator thigmotacticus committeeoides,* or possibly *Cunctator progressivus academiae.*

Now, it is with a rather lively recollection of that warm afternoon in Paraná that I see myself about to do, perhaps, no better than run forward on your courteous patience, only to measure with a quite illusory suggestion of free choice a modest inch in the direction already determined by the majority and by the past.

Tonight, I want to offer you—and in a more serious vein—comment on some aspects of your field—anatomy. I use the word *aspects* deliberately. I do not mean factors or elements. I am not an insider and do not have a working familiarity with the factors, the elements and the true inwardness of your interests and your work. The word *aspects* suggests views seen from the outside, partial, perhaps, but, if partial, then due to the laws of perspective rather than to any deliberate rearrangement of component parts. I have the outsider's perspective. Indeed, perhaps I am almost a professional outsider. With no special competence or zealous allegiance to any one field, I have for several years intentionally exposed myself to the thrusts and tugs of every field in medicine with the hope that I might attain by slow acceleration a sort of gyroscopic calm and an equanimity inaccessible to the thrusts from any one field.

But it is hardly reasonable to claim that perspectives are better than the insider's knowledge. Supplements are poor substitutes. And sketches for many purposes are not as good as plans. But, if part of the task of anatomy in its teaching is to adjust itself to the rest of medicine gracefully and fruitfully, then an outsider's views may merit attention and reflection in moments of eupeptic relaxation and postprandial liberality.

In the foreground of my perspective on anatomy appears something obviously non-technical and apparently irrelevant and possibly extensively ignored or belittled. It does not concern anatomy exactly, but it could be of immense moment to anatomists. Quite simply it is this: You anatomists are the first teachers whom

medical students encounter. More than that, they meet you when they are extraordinarily impressionable and keen and in a critical transition in their professional education. The anatomist stands before successive classes of from 50 to 150 students year after year as the first intimate example of a medical scientist. Whether or no he is gifted at exposition, he will be stamped indelibly on the students' minds and spirits as a person. Most of the facts he now teaches can be corroborated by reading or expanded by experiment and dissection, but his example must—and always does—remain, without retouching, an autographed original. With or without declarations on his part, the students sense his views and intuitively know his values—his thoroughness, his accuracy of observation, his tolerance and intellectual honesty, his enthusiasms and, perhaps, his ennuis, the value he attaches to the scientific method, his measure of human dignity, in short, the breadth and range of his sympathies and interests as a teacher of physicians. As first year medical students, we in this room were also alert and impressionable, and, therefore, we remember our professors of anatomy with such clarity and—delightful memories—in so many instances with such gusto. Surrounded by impressionable students (and it would be almost the same regardless of what subject in medicine was presented to them first) you have the unique assurance that if you are broad and yet eager in your interests, your example will set the tempo and standard of performance of more students than can be reached by any other subsequent teacher in the course. There is great economy in setting a good standard at the very beginning.

The personality of the anatomist is, thus, the first and strongest of the beginner's impressions. They may be well balanced impressions, received and reflected on with aplomb and maturity. More often than not these impressions are hasty, intense, ill balanced affairs, hence all the greater need for breadth and steadfastness (neither being incompatible with fire and enthusiasm) in the teacher.

Perhaps, it seems forced, romantic, and irrelevant to suggest that antomists play consciously or unconsciously a rôle far more inclusive than their subject suggests. To most of the first year students the antomists are—until they show themselves inadequate—the protagonists and exemplars of medical science and its traditions. Mind you, I do not imply that the pedestals constructed by modern young men are particularly roomy at the top. You can fall off easily enough, for you are being watched by students whose intuitions have already forecast the chance that anatomy may have the finality of deadness, the narrowness of a specialty, the competitive challenge but also the intrinsic futility familiar to any quarry slave. When anatomists are only anatomists, students remain only students, and nobody grows up. When anatomists show that they have valences enough to combine with all the other medical disciplines, every one grows up.

Because you come first in the students' experience, you pitch the tune—I think more than you realize. Involuntarily, and sometimes unwittingly, you, nonetheless, exemplify to the beginner whatever there may be in medicine of interest, of wonder, of delight, of realism, and of the meticulous observation and

cautious reasoning and restless speculation in the long tradition of Hippocrates. Obviously then, the larger the anatomist's cultural baggage the more eager, graceful and far reaching will be the progress of his students.

To bring these random generalities to a sudden point, why don't you anatomists set aside Wednesday night—at home or at school—as a time to talk with students informally about anything? Let them know that you will merely be waiting until at least one student comes—that you have set aside the evening exclusively for that purpose. As I see the preclinical teaching in American medical schools, there is a rather pathetic over-emphasis on the formal duties of the teacher and an almost timorous evasion of the informal simpler relationships he could maintain with pupils. So much professing a single subject, so little placement of it in relation to the rest of living!

I have said the first year is a period of transition. It would be difficult to exaggerate the extent of the changes then experienced. The medical student finds himself in more rigorously chosen company than he was in his freshman year in college, or the first year in high school. And not only are his companions of better quality but they are more earnestly bent on using their abilities than ever before. These two factors alone are a substantial change to adjust to. The lowing herd winding slowly o'er the lea of college has turned into something much nearer a race for the stables, and the individual's emotions have changed accordingly. Then, too, there is a change in the attitude of the teachers: in the medical school the beginner feels not so much guided as watched, coolly. Franklin P. Mall's announcement to the beginners in anatomy went, I am told, something like this: "Gentlemen, the dissecting rooms are open from 9:00 A.M. to 10:00 P.M., except on Saturday and Sunday. There will be instructors available if you run into difficulty. The recommended texts are posted on the bulletin board, and when you are ready to take the examination let me know." Is any argument needed to prove that such treatment of college boys constituted a change of intellectual climate? And with no weather bureau to issue as little as three days' warning!

In addition to these changes, the first year medical student is very commonly for the first time in an environment where all his courses are plainly converging to one purpose—to make him a doctor. There were isolated meaningless courses in college, but he suspects that nothing is meaningless now. He eagerly seeks the bearing of anatomy on the rest of medicine. There is some evidence, too, that substantial readjustments are taking place in the inner life of the first year student. He has seen dead human beings probably for the first time, and very naturally he must improvise some technique either to answer, postpone, or evade the numerous riddles always posed to the novice by the mute mask of a cadaver.

Why could not the anatomist, in one preliminary hour, play the kindly rôle of weather forecaster and explain to first year medical students that their intellectual climate is about to change, and how? Is the omission to do this by tradition, inadvertence or on principle? So commonly youth meets the unexpected with fortitude but in a quite unnecessary loneliness. There would be immense economy

if every member of the class understood these transitional difficulties to be general and characteristic, not private and unique. Such candid discussion as I advocate seems to me all the more needed if the war's speed-up is to invade hours formerly available for reflection and assimilation.

Up till now my purpose has been to point out how important you are to the medical student because you are the first person he can watch and know at a time when he is setting up new interests and new standards of performance. I want to make you see your value on another score. You, more than the others, have the chance to be the first teachers of the art of observation—the first of the three essentials of the intellectual side of medicine. These essentials I take to be the ability to observe accurately and comprehensively, the ability to reason from these observations, and the ability to find and compare critically and honestly one's own observations and inferences with the experience and reasoning of others.

Though there are those who do not admit that the anatomist teaches a useful kind of observation, I would be disposed to say the great service of the antomist is that he can and often does teach the beginner how to observe accurately and comprehensively. It is a very real question whether as a teacher of observation the pure morphologist is not seriously handicapped by the nature of his material. His material is in the main static. To observe movement, change and the effect of forces is much easier than to give a clear description of a static or permanent situation. You cannot describe a table in terms of tables only; you must employ such concepts or terms as plane surfaces, shape, size and material. In somewhat the same way, the beginner finds difficulty in observing purely static appearances and relationships.

In the face of this inherent difficulty, one possibly useful and feasible course is to find out what are the most vivid and memorable ways of apprehending morphological essentials and relations. From experience as a visitor in many countries besides the United States, my impression is that usually the anatomist, after varying amounts of experimentation, chooses inevitably and only naturally the teaching methods which seem most vivid and memorable to *him*—and the class goes over the hurdles and through the hoops. I have yet to see the study of morphology preceded by a study of the students to find out how the individual members of the class learn best and remember best. Some of us are predominantly visual in our learning processes, some auditory, some kinesthetic; many of us show rather evenly balanced blends of two or three of these senses. Perhaps, there are other avenues of learning we do not yet understand. I had a classmate who learned anatomy by reading his Cunningham to a dictaphone and then lying down and listening to it: his life was auditory, even to the recognition of acquaintances, who remained strangers till he could hear their voices. A classmate of my brother, having a strongly kinesthetic approach to the physical world, learned his drug dosages by this curious expedient. He tacked up some empty cardboard boxes in different parts of his study-bedroom, having marked each with some one of the common drug dosages, such as 5 grains, 1 grain, ¼ grain, 1/10 grain, 1/100 grain, etc. Then, he wrote on separate slips of paper the names of

the drugs to be learned. When he had taken the slip marked morphine to the $\frac{1}{4}$ grain box on the closet door and dropped that paper in that box, he had no difficulty in remembering where he had been with morphine—and so he remembered the dosage.

I suspect that this kind of sensory dominance influences our living more than we have realized. This suspicion was refreshingly strengthened recently when a friend made the amusing but momentous discovery that when he travels with his wife he pulls down the shades and is simply unaware of an open transom which lets what he says be heard in the hallway of the hotel, whereas his wife never bothers about the shades but is in an agony of embarrassment at being overheard. It would seem that modesty as well as memory can be auditory or visual. In this particular instance, of course, I could only assure my friend that as long as his wife accompanied him, and he her, the effect was notably decorous.

With such variety of learning capacities among students, I am never surprised to find that a loose, adjustable system of teaching anatomy which leaves much latitude to the students is more effective than its evident formlessness would lead one to expect. Would it not be an educational economy to show each student what balance or complexion of visual, auditory and kinesthetic senses he possesses, and urge him to adapt his ways of study to his natural endowments? Is there a medical school where the first effort is to help each student to find his own natural, effective and economical methods of learning anatomy?

As for observation, and the teaching of how to observe, it seems to me that for want of studying what observation is, what hinders it and what helps it, we are in a rather early and primitive state, as we were once with cannons and mortars before ballistics was recognized as a field of knowledge regardless of what you might be shooting at. In a similar fashion we need a more intensive study of the nature and elements of observation, regardless of what you may be observing. The present literature on the subject is invitingly scant and arid.

Thus far the perspectives I have offered you have shown in the foreground anatomists rather than anatomy, anatomists as the unforgettable first influences in the medical course, anatomists as leaders and protagonists of the art of observation. Now, let us turn to the teaching of anatomy. If this were an international gathering, I should be extremely embarrassed, but I suppose of all the national groups of anatomists the world over the American anatomists are the least likely to be surprised or show resentment at most of what follows.

The amount of time and effort now devoted to the dissection of the human body and to purely morphological studies could well be substantially reduced, and I think probably will be. In those subjects, i.e., dissection and purely morphological studies, more emphasis should be placed on teaching the student how to find out what he may want to know and less time should be wasted on cramming minutiae for regurgitation at examination time.

In place of so much emphasis on dissection and morphology I should hope, in the realignments and reorganizations which will be overdue by 1950 in medical school curricula, that we shall see much of the old style anatomy giving place to

still more important elements of human biology. A large number of you are experimental biologists already. I am afraid that unless anatomists include new and appropriate elements of human biology in their teaching activities, the pressure from other disciplines will be purely cannibalistic and the anatomists will lose too much. It seems wiser for them to substitute human biology (which is needed) for details of morphology (which are not), and to increase their value to the students by the breadth of their knowledge.

I do not for an instant believe that such a change will be unqualified gain. An old Frenchman once made a wise remark to a friend of mine, "Remember, my boy, you can have anything you want in this world, but don't forget the price to pay for it." We shall pay for the curtailment of extensive drill in dissecting and the mastery of spatial relationships and the character and position of different organs and tissues. There is a certain residue after any rigorously acquired mastery of any subject, even when all is forgotten, and that residue is usually valuable. But the very facility with which morphological facts lend themselves to utterance and demonstration, and the great tradition of anatomy which this facility made possible, has postponed our asking ourselves the most important question of all, "What of it?" which, being interpreted, means "granted that all these anatomical facts you know are true, what is their importance relative to other kinds of knowledge in point of what's to be done in research and teaching and the practice of medicine in the next twenty-five years?" To meet any such test as that I would prefer more human biology and less anatomy.

What does human biology mean? Biological studies of human life, made broadly enough to include, for example, the study of individuality (what George Draper calls "otherness"), or the study of growth and the aging process, or the study of the endocrines, or the still scantily explored field of mammalian heredity —any one of these more valuable for the medical student as a lively and stimulating field of thought than either the content or the residue of morphological masteries.

And yet every one of the phases of human biology just mentioned has its anatomical component. I suggest no merciless attack on morphology. Anatomy should not and will not be pushed off the pier. The intensive preoccupation with morphological problems will, I hope, continue as research work or in advanced courses. The situation is rather this: for the student so many new and important kinds of knowledge are now available that what experience indicates as of subordinate importance in anatomy should be subordinated.

In most faculties there is resentment at the reluctance of anatomists to cede any more of their time. The realist would say that those who want the time now allotted to anatomy reduced are motivated by two very different reasons. In the first place, their sense of proportionate values tells them that time would be better spent on other things than structural minutiae, and, in the second place, they could use a few more hours now possessed by the antomist for their own subject. The anatomists bitterly and foolishly think that the second motive—cannibalism—is the whole story. It is not, but unless the anatomists have more

to teach and learn than old style morphology, they are in a precarious position because of the first reason. If they would broaden themselves into human biologists, they would have to cede no more of their hours, for human biology is precisely what is needed in all medical schools.

I have no desire to embitter you or to stir up resentment against your medical school colleagues by a sort of ventriloquist's placing in the mouths of others utterances that are more nearly his own. I would rather urge you to look at the situation in terms of the growth and needs of medical education as whole. It has been observed that love is like a breakfast egg—if there's any doubt about it, there's no doubt about it. The frequency and extent of the criticism of the time devoted to anatomy nowadays raises similar doubts in many minds. Anatomy could, and probably will, lead the way in response to the pressure for other subjects in its place by applying these partial solutions to its problem: first, in its teaching procedures it will reduce the hours of dissection and the effort at memorizing facts of subordinate importance and use the time thus saved for general biological studies; second, it will stress the value of teaching how and where to find out what anatomical facts one wants to know; and third, it will continue to teach standards of thoroughness and accurate observation, though on a less protracted schedule, except in advanced courses.

I realize perfectly that in many departments of anatomy in the United States the emphasis I have argued for exists already, and any distorted overvaluation of the study of substance and structure has already been radically corrected. In some of these schools, however, the old course in gross anatomy is about what it used to be; the leaven is only in the advanced courses. And in plenty of schools I have visited the anatomists are conservative and intransigent to a degree that endangers the best as well as the least valuable contributions they make to the education of the medical student.

Making a sally for a moment from the subject of anatomy and its teaching, may I make a few comments on conservatism as seen in human institutions, professions and associations of many kinds?

The active conservatives are rarely the young. The old, especially where property and allegiance to tradition are involved, are likely to be conservative, or at least cautious lest the baby be thrown out with the bath. It is, however, not uncommon to find bold and categorical ideas among the oldest members of a profession, perhaps because they have, above all others, the sense that times have changed and are changing and must change, and that institutions must change if they are to stay in the picture at all. No—where I expect outraged and belligerent conservatism is neither among the young nor the old, but rather in the middle years. They have served seven years for Rachel and if given Leah they will doggedly start in again for Rachel, but just try suggesting that the rules of the contest be changed! To most conservatives, change betokens interruption and confusion of work as well as loss of the product. And their resentment at intrusion is greater often than their objection to loss.

We would be wiser in the guidance of human institutions if more of our

histories were written by the losing side. Usually it is the winners, or their dependents, or their admiring descendants, who write the history of this or of that enterprise. From such histories we learn the earliest characteristics of healthy growth and ultimate victory. We learn how to discern the reliable signs of eventual success in a struggling movement. But such skill does not sharpen our wits to recognize the signs and symptoms of the opposite kind of outcome—of remote but inevitable and oncoming failure. We cannot get familiar with danger signals and warnings of trouble ahead by reading success stories. Our ignorance in these matters is comparable to that which would characterize medicine if there were no pathologists—pathologists who write the history of lost struggles and unhappy endings and thus teach us to recognize the early signs of dissolution or failure.

In default of the wisdom of others in these matters let us at least begin to thresh the matter out by making these tentative hypotheses:

An institution is due for undesired but inevitable change when its past receives more consideration than its future.

An institution whose members are forever on the defensive is on the way out.

An institution with a vast load of routine and detail to take care of usually has no time or strength to notice what is going on around it.

An institution which is unaware or negligent of opinions current in its environment is in the position of an animal deprived of sight, hearing and smell —the wisest course is promptly to become indispensable or parasitic to a protector.

You will, perhaps, think these hypotheses a sort of oblique Jeremiad on the subject of anatomy. The obliqueness is not intended as an evasion but as a way of calling attention to the impersonal fact that many of the characteristics of the defenders of old style traditional anatomy are these same warning signs of eventual loss, failure or defeat. These warning signs, as we have just seen, are these: being dominated by tradition; being constantly on the defensive; being ignorant of and ignoring current opinion, and being so busy with details as to have lost completely any sense whatever of the obvious.

I hope I have not seemed to offer you these intimations of impending change as if they were just impartial reporting. It is true, I think, that impartial reporting would bring exactly the same message. But I should add, in all candor, that I am not impartial and have explicit personal views on the present status of anatomy in relation to the rest of medicine. Briefly, those views are these: It is now time to run the risks inherent in every change in order to provide the medical student with a broader biological horizon. This should be done at the explicit and direct expense of his knowledge of the extensive minutiae of anatomical structure. In many schools still the time and effort devoted to memorizing facts of anatomy is a serious and no longer defensible disregard of how time can best be employed by the medical student. During the centuries when medical education possessed nothing else than anatomy which could be taught with precision and vigor, the emphasis on morphology was probably

justified and the knowledge so acquired was retained by minds not subsequently overburdened. Nowadays the time to refresh and retain extensive anatomical knowledge is no longer at the disposal of most students and young physicians. The effort spent in anatomy is spent in securing information which stays in mind about as long as it is of use. By any such criterion this effort should be reduced.

Besides, it will soon be 500 years since printing was made available to scholars, and that would seem a reasonable interval in which to have learned what books are good for.

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I have ventured this evening to discuss some aspects of your field and to advocate in place of the traditional emphasis on dissection and morphology a freer range of interest in human biology. I know that trends in American anatomy in the past twenty years have been such as to make my comments in some measure an example of preaching to the converted. Nonetheless, the next ten years will almost certainly witness a rather far reaching revaluation of all of the component parts of medical education, followed by reform of the curriculum. If I were a young anatomist, I would take measures to broaden my horizons as a biologist, and the more so because the first teacher to meet the incoming medical students is in a position of singular influence and importance—especially if his interests and knowledge be broad enough to articulate with many of the succeeding disciplines. Yours, too, is a cardinal rôle in medical education—to be the first exemplars and the accepted models of accurate and alert observers. It seems at least probable that if we could collect and study some observations on the art of observation, if we could find out what determines accuracy and completeness of observation, we could substantially improve the teaching and the rôle of that essential component of medical education and medical practice.

I have no triumphant peroration for this talk. I have been surer of my statements than of my being the person to utter them. And so because diffidence can stifle candor, I have forced myself to be outspoken and direct. With one last bit of friendly bluntness let me finish: Let us recall that it is the duty of every profession to reduce where possible the need for its services. This policy, as experience has shown, can only add to the dignity and worth and freedom of those who follow it.

Principles of Aviation Medicine*

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HISTORICAL

Leonardo da Vinci, practicing both art and science, drew designs of various types of aircraft, some of which closely resemble those in use today. The first actual flight made by man was in 1783 when de Rozier, a French nobleman, was raised aloft in a huge, smoke filled balloon. Two years later, Dr. John Jeffreys, of Boston, flew with the Frenchman, Blanchard, from Dover, England, to Calais, France, in a hydrogen filled balloon. In 1862, Glaisher and Coxwell ascended in a balloon to an altitude of 29,000 feet. The paper which Glaisher wrote, in which he described his loss of vision and paralysis of his arms and legs, stimulated Paul Bert to begin his brilliant investigations on the effect of decreased and increased barometric pressures. Sir George Cayley designed a fixed wing glider that could raise him from the ground, but the first actual, heavier than air aeroplane that made a successful flight was that of the Wright brothers, who in 1903 made their first flight in North Carolina.

Since that time the aeroplane has indeed made a remarkable advance. Man now flies up to 9,000 feet without oxygen and with very little effect on body function. From 9,000 to 33,700 feet he now compensates for the lowered pressure of oxygen in the thin atmosphere by breathing oxygen in increasing concentrations from 30 to 100 per cent. Breathing pure oxygen, various people have flown as high as 45,000 feet and, in one instance, to 47,000 feet, but not without impairment of mental and bodily functioning. As indicated in Chart 1, flying between 34,000 and 45,000 feet, even during the inhalation of 100 per cent oxygen, is dangerous, for the pressure of oxygen in the arterial blood falls sharply above 35,000 feet.

Following experiments by Wiley Post in 1933, the British Royal Air Force developed the pressure suit to make a new world's altitude record. In 1937, Flight Lieutenant Adam flew to 53,937 feet, using a pressure suit filled with oxygen and adjusted to a pressure not to exceed a fixed value of two and one-half pounds per square inch, or 130 mm. Hg. above that of the surrounding air.

The oxygen pressure gondola, first used for flights into high altitude by Prof. A. Piccard of Belgium, consisted of a sealed metal sphere within which a sea level pressure of oxygen was maintained by means of the gradual evaporation of liquid oxygen. The latest flight of Stephens and Anderson, which took place in 1935, made a new record of 72,395 feet. The balloon which carried the oxygen pressure gondola had a volume of 3,700,000 cu. ft. and used helium for the lifting

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*Read at the Fifty-second Annual Meeting of the Association of American Medical Colleges, held in Richmond, Va., October 27-29, 1941.

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medium. Air samples, obtained near the ceiling of this flight, showed that the proportion of the component gases in the atmosphere was about the same as that found at sea level.

The oxygen pressure gondola is not of practical value, either for civil or military aviation. It may be said that the pressure suit, which the British Royal Air Force used, is not likely to have military exploitation because the increased pressure makes the wearer almost immobile. However, the pressure cabin aeroplane, which was developed first in 1920, has been successfully used in substratosphere flying, about 20,000 feet, flying from New York to the west coast, and it

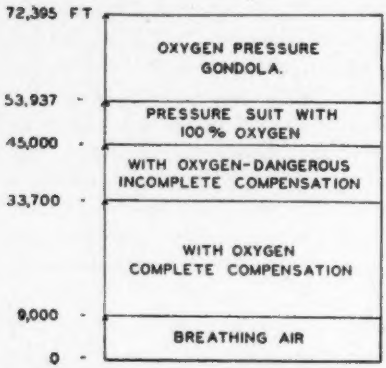

CHART 1. Methods of Reaching High Altitudes.

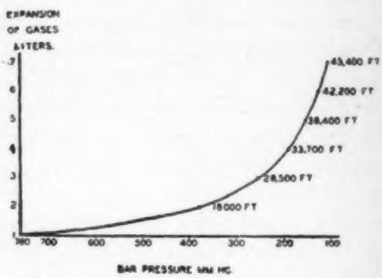

CHART 2. Expansion of Gases at Various Altitudes.

has been also employed in military operations above 40,000 feet during the present world war. In this type of aeroplane, the pressure in the closed cabin is generally set at that which would be present at an altitude of 8,000 feet. Although the individual is quite comfortable in these cabins, the great danger in military aviation is that a leak in any part of the pressure cabin, at an altitude of 40,000 feet, would precipitate acute oxygen want with unconsciousness, and also might result in the development of aeroembolism bends. It seems likely, none the less, that in the future there will be more and more expert development of pressure cabins, both for civil and military purposes. At the present time, the vast majority of aeroplanes which travel at high altitudes cannot employ pressure. The pilot breathes oxygen-enriched atmospheres up to 100 per cent oxygen to compensate for the diminished pressure in the atmosphere. The passengers, both civil and military, are pursuing a safe course in inspiring oxygen at altitudes above 10,000 feet, as will be made clear in the succeeding section.

PHYSIOLOGICAL FACTORS INVOLVED IN HIGH ALTITUDE FLYING.— The fact that engineers have built planes that climb above 55,000 feet and travel faster than 7 miles a minute has confronted the physiologist and the physician with four major problems: (1) oxygen want; (2) air bends (aeroembolism); (3) pressure disturbances in the ears, nasal accessory sinuses and abdomen; and (4) the effects of centrifugal force.

The most fundamental physiological factor which is involved in ascending to a high altitude is the expansion of the gases in the atmosphere in inverse relation to the pressure. In Chart 2, a diagram illustrates the expansion of 1 liter of gas at various altitudes. It will be seen that at 18,000 feet, one liter of gas has expanded to two liters and at 33,700 feet to four liters, and at 42,000 feet to six liters. Since the volume of the chest remains constant, the expanded air in the lungs contains a progressively smaller amount of the individual air constituents. Thus, one liter of air at 42,000 feet would only contain one-sixth as much oxygen as it did at sea level. Breathing 100 per cent oxygen cannot compensate for altitudes above 34,000 feet, since expansion of an atmosphere of pure oxygen ultimately results in such dilution that an insufficient number of oxygen molecules exists in the lungs to maintain a normal pressure of oxygen. The number of oxygen molecules in a given space becomes progressively smaller as the pressure is lowered. The water vapor pressure in the lungs remains almost constant, and the pressure of carbon dioxide persists, moderately lowered by increased ventilation. The sum of water vapor and CO_2 pressure must be subtracted from the total pressure, and what is left consists of the oxygen pressure. Thus, at a high altitude in which the individual was breathing fairly hard, although inspiring 100 per cent oxygen, the total water vapor and carbon dioxide pressures might be 47+35, or 82 mm. Hg. If the barometric pressure was 138 mm. Hg., the pressure of oxygen in the lungs would be 138 minus 82, or 56 mm. Hg. even while he was inhaling pure oxygen.

One of the most apparent effects of ascending to a pressure equivalent to 40,000 feet in a chamber, is the distention of the abdomen. The gas in the intestines will expand, for example, from one quart to more than four quarts, which would make the individual uncomfortable were it not for the fact that, as the gas expands, it generally passes through the intestinal canal and is gotten rid of in large amounts. If some obstruction is present in the colon, severe pain ensues, and the pressure is promptly lowered if it is feasible to do so.

OXYGEN WANT.—As seen in the previous charts, when an individual has ascended to an 18,000 foot altitude, a unit volume of air in his lungs has expanded to two volumes of air, and contains only one-half as much oxygen as was present in the original unit volume of air at sea level. Breathing air at 18,000 feet is equivalent to breathing 10 per cent oxygen at sea level, which is approximately one-half the concentration of oxygen in the atmosphere, i.e., 20.93 per cent. The pressure, therefore, of oxygen in the alveoli of the lungs falls as the altitude is increased. This is shown in chart 3 in which a normal alveolar oxygen pressure of 108 is seen to fall to about 38 mm. Hg. at an altitude of 18,000 feet. The pressure of carbon dioxide in the alveoli of the lungs remains relatively constant up to the point where the individual begins to hyperventilate. This may begin as low as at 10,000 feet. The CO_2 pressure is apt to fall gradually until an altitude of about 15,000 feet is reached when, due to a sharp increase in pulmonary ventilation necessitated by the diminishing oxygen pressure, it may rapidly fall to 25 mm. Hg. at an altitude of 18,000 feet. At this point, the

human subject is suffering both from severe oxygen want and from alkalosis, the latter produced by a disproportionate loss of carbon dioxide from the lungs.

If we were to measure the oxygen saturation of arterial blood at various altitudes, we would find that the blood becomes progressively less saturated with oxygen as the altitude is increased. Thus, at 16,000 feet, the saturation of the arterial blood with oxygen would be about 74 per cent (Chart 4). At sea level, the hemoglobin in arterial blood is 95 per cent saturated with oxygen. Paul Bert was the first to point out that the primary effect of altitude on the human being was due to the diminished pressure of oxygen in the atmosphere. One of his subjects, Tissandier, undertook a balloon flight with Croce and Sivel in 1875. The latter part of the flight was described by Tissandier as follows: "Body and mind become feebler . . . There is no suffering. On the contrary, one feels an inward joy. There is no thought of the dangerous position; one rises and is glad

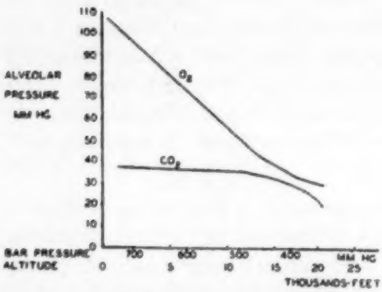

CHART 3. Alveolar Oxygen and Carbon Dioxide Pressures in a Human Subject while Breathing Air at Varying Altitudes.

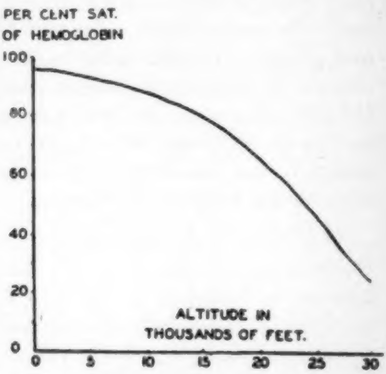

CHART 4. Oxygen Saturation of Arterial Blood at Varying Altitudes.

to be rising. I soon felt myself so weak that I could not even turn my head to look at my companions . . . I wished to call out that we were now at 26,000 feet but my tongue was paralyzed. All at once I shut my eyes and fell down powerless and lost all further memory." The balloon ascended to 28,820 feet and then came down of its own accord. Tissandier recovered but his two companions were dead. Since that time many investigations have been conducted at high altitudes, particularly in high mountains, and by laboratory experiments in which either the percentage of oxygen or the pressure of oxygen was lowered. It becomes clear that for proper activity of any organ, oxygen must be supplied at a pressure which is not far below that present in the atmosphere.

THE SYMPTOMS OF OXYGEN DEFICIENCY

The early signs of oxygen want are a more rapid beating of the heart and an increased volume of breathing. After some hours' exposure to a moderate altitude, such as 12,000 feet, characteristic symptoms appear, namely headache, nausea and lassitude. If the exposure is more prolonged, or the altitude is higher,

more severe symptoms take place, such as vomiting, fever and pronounced mental impairment. When lack of oxygen is very severe, the pulse becomes rapid and feeble, consciousness is greatly impaired and finally lost, and progressive damage is done to the central nervous system, heart and other organs.

Within recent years, the effect of moderate altitudes has been studied carefully, primarily because of the fact that in civil aviation aeroplanes were being flown at altitudes of from 10,000 to 12,000 feet. Investigators have shown that mental impairment unquestionably takes place at altitudes of 12,000 feet and over, when the average subject is exposed for a period of three or more hours to this atmosphere. There is a decrease in memory, reason, judgment and emotional control. Some of us believed that "pilot error" was in some instances caused by impaired judgment due to oxygen want at these altitudes. A prolonged series of hearings were held before a subcommittee in the United States Senate in 1936 to investigate certain aeroplane accidents, and notably the one in which Senator Cutting was killed. In the book then issued on the topic "Safety in Air," the possible effect of oxygen want on the pilot's judgment was not discussed. This is all the more remarkable because Pilot Bogan had been in the air between nine and ten hours, flying to altitudes as high as from 10,000 to 12,000 feet. It is now recognized that pilot fatigue is not due simply to the stress and strain of conducting an aeroplane through uncharted areas in the sky but may be the result, to a considerable extent, of mild degrees of oxygen want. On May 1, 1941, the Civil Aeronautics Board inserted the following amendment in its regulations: "Post 61.743. Oxygen Apparatus and its Use. No air-carrier aircraft shall be operated in scheduled air transportation at an altitude exceeding 10,000 feet above sea level continuously for more than thirty minutes, nor at an altitude exceeding 12,000 feet above sea level for any length of time, unless such aircraft is equipped with an effective oxygen apparatus and an ample supply of oxygen available for the convenient use of the operating crew, and proper use is made of such apparatus."

It is important to remember that certain tissues are sensitive to oxygen want and others are relatively insensitive; thus, the extremities may be deprived of oxygen for periods of an hour and one-half by complete closure of the arterial blood supply and thereafter may be used with completely normal function. However, a guinea pig dropped in an atmosphere of nitrogen dies of convulsions within from fifty to sixty seconds. Human beings may die or suffer from severe brain hemorrhage when exposed to complete asphyxia for five minutes. The brain is the organ most sensitive to oxygen want, and impaired mental concentration begins after exposure for several hours to altitudes between 10,000 and 12,000 feet. In exact investigation, changes in visual function have been observed at altitudes below 10,000 feet. Between 12,000 feet and 18,000 feet, the effects on mentality are similar to alcohol intoxication. In the larger percentage of human subjects feelings of well being take place, with hilarity and increased talkativeness. In a smaller group, depression, slowness of response and sleepiness occur.

The organ which is next most sensitive to oxygen want appears to be the heart. An increase in pulse rate is one of the earliest signs of ascending to high altitudes, and in many instances the T wave of the electrocardiogram has been shown to be depressed at altitudes as low as 8,000 feet. In patients with coronary artery disease, the inhalation of low oxygen mixtures, corresponding to altitudes of from 15,000 to 18,000 feet, has been made use of as a test of a constricted coronary artery. In many instances characteristic anginal pain, with accompanying electrocardiographic changes, such as depression of the ST segment and the T wave, are produced during a period of twenty minutes' inhalation of these low oxygen atmospheres. This is obviously of importance when we consider the transport of patients by aeroplane at altitudes of 12,000 feet, if there is not provision for the continuous inhalation of oxygen.

The pathological changes caused by severe oxygen want affect, primarily, the blood vessels; these consist of dilation of the capillaries, with increased permeability, hemorrhage, edema and perivascular infiltration. Both large and small hemorrhages have been observed and affect the nerve cells in the cortex of the brain, as well as the corpus striatum and the medulla. Hemorrhages have also been found in the heart muscle and the mitral valve, and in the lungs, kidneys and other organs.

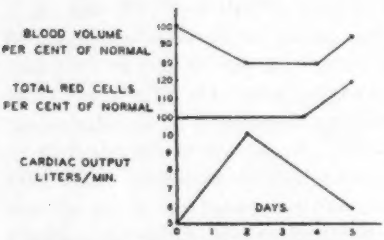

CHART 5. Effect of Residence at 14,000 Feet, on Blood Volume, Total Red Cells and Cardiac Output.

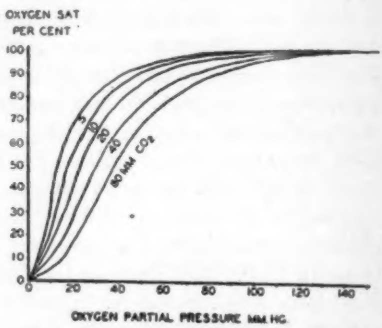

CHART 6. Per Cent Saturation of Hemoglobin with Oxygen with Different Partial Pressures of Oxygen and Carbon Dioxide.

COMPENSATING PHYSIOLOGICAL CHANGES IN MAN AT HIGH ALTITUDES

The physiological changes which take place at high altitude depend on whether the ascent has been made gradually, as in train transport to high mountains, or whether the ascent has been swift, as in aeroplane travel. The effect of continuous residence at an altitude such as 14,000 feet is shown in Chart 5. On the day after ascent to such an altitude, there is a decrease in the blood volume which is more marked on the second day. At the same time there is a rise in the flow of blood through the heart. The increase in cardiac output two days after arrival at 14,000 feet is about 100 per cent. This is accompanied by a 20 per cent contraction in blood volume, which gives the appearance of an increase

in the number of red blood cells. Although the number of red blood cells per unit of circulating blood has been increased as a temporary mechanism to carry more oxygen, there is not an actual increase in red cells until about the fifth day, when stimulation of the bone marrow (as a consequence of oxygen deficiency) results in an outpouring of new red corpuscles. The cardiac output, which is increased to furnish an increased amount of oxygen per unit of circulating blood, gradually decreases from the second to the fifth day, when the increase in hemoglobin and red blood cells has taken place.

The individual has also compensated in other ways, such as an elevated volume of breathing with a resultant increase in the elimination of carbon dioxide, a greater elimination of alkaline salts through the kidney and, perhaps, also a redistribution of blood to those organs which are most oxygen sensitive.

THE OXYGEN DISSOCIATION CURVE

Much of our understanding of the oxygen supply to the body tissues has been derived from knowledge concerning the oxygen dissociation curve of hemoglobin. The hemoglobin in red corpuscles in arterial blood holds and releases oxygen in a special way, which is primarily dependent on the pressure of oxygen to which it is exposed. This characteristic way of binding oxygen to hemoglobin is shown in Chart 6.

About nineteen-twentieths of the oxygen carried in the blood is bound to hemoglobin and one-twentieth is found in physical solution. A pressure of 100 mm. Hg. of oxygen results in an oxygen saturation of the hemoglobin of about 95 per cent, and as the blood is exposed to a lower oxygen pressure, the oxygen saturation of hemoglobin curves downward, with especial swiftness below a pressure of 50 mm. Hg. The chart also reveals an alteration of the amount of oxygen that is held by hemoglobin, depending on the pressure of carbon dioxide to which the blood is exposed. Thus, when blood has an oxygen saturation of 70 per cent and is in contact with 5 mm. CO_2, the oxygen partial pressure will be approximately 22 mm. Hg. If, however, blood at a saturation of 70 per cent is exposed to 40 mm. CO_2, the partial pressure of oxygen will then be about 44 mm. Hg. This is a fact of great importance in regard to tissue respiration. As the blood circulates in the capillaries, it is exposed to carbon dioxide which makes it give up oxygen more readily. As the blood passes into the lungs, when the carbon dioxide is liberated, the hemoglobin takes on relatively more oxygen.

One of the most constant effects of exposure to high altitudes is the increase in the rate and depth of breathing. As a consequence of the increased volume of ventilation, there is a fall in the pressure of carbon dioxide in the lungs. As more carbon dioxide is eliminated from the lungs, the blood becomes less acid. It has been shown that the effect of carbon dioxide described above is due to its acid quality; addition of CO_2 makes blood more acid and elimination of CO_2 renders it more alkaline. The effect of the decreased acidity of the blood is, therefore, that the hemoglobin holds on to oxygen more tightly and the tissues suffer from a decreased tension of oxygen, even though the oxygen saturation of the blood

is at a relatively high level. Thus, in experiments in which cardiac patients have breathed 10 per cent oxygen the pH has been observed to rise from 7.44 to 7.54 due to loss of CO_2. This would mean that the tissues would be exposed to a pressure of 35 mm. Hg. of oxygen, instead of 40 (Chart 7). In other words, a more alkaline condition of the body, alkalosis, produces a form of oxygen want due to shifting of the oxygen dissociation curve to the left. The state of alkalosis has been shown to result in constriction of peripheral blood vessels, so that ischemia is also produced. In other experiments on patients with coronary artery disease, the inhalation of small percentages of carbon dioxide, together with 10 per cent oxygen, has prevented the occurrence of anginal pain by preventing the loss of carbon dioxide. In summary, it may be said that excessive elimination of CO_2 from the body does harm in at least two ways—(a) by making the hemoglobin in the red cell more alkaline and thus give its oxygen less readily in the

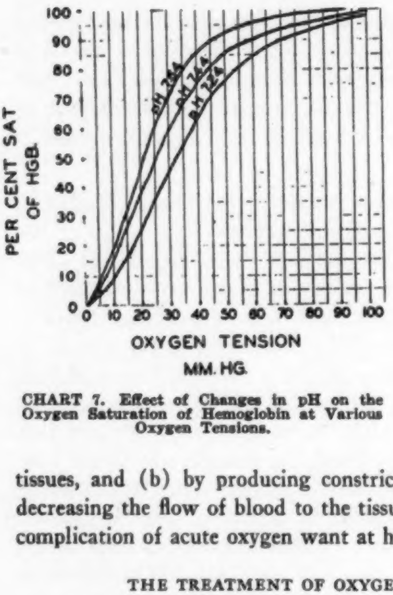

CHART 7. Effect of Changes in pH on the Oxygen Saturation of Hemoglobin at Various Oxygen Tensions.

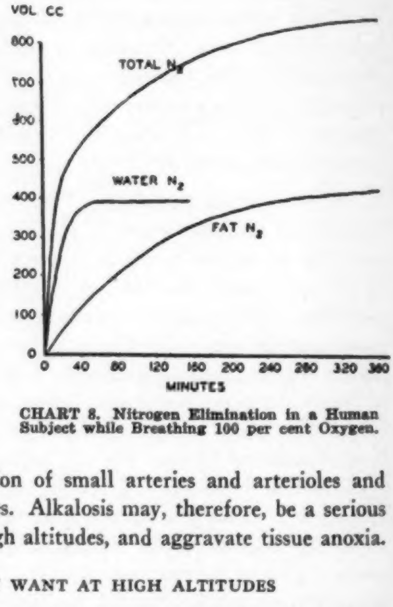

CHART 8. Nitrogen Elimination in a Human Subject while Breathing 100 per cent Oxygen.

tissues, and (b) by producing constriction of small arteries and arterioles and decreasing the flow of blood to the tissues. Alkalosis may, therefore, be a serious complication of acute oxygen want at high altitudes, and aggravate tissue anoxia.

THE TREATMENT OF OXYGEN WANT AT HIGH ALTITUDES

If an individual is exposed to a high altitude on a mountain, such as from 10,000 to 14,000 feet, an illness called "mountain sickness" takes place, which is in most cases apt to disappear on the fifth or sixth day of residence. It is only in severe reactions, or in patients with cardiac or pulmonary disease, that inhalation of oxygen is necessary. The physiological compensations discussed above gradually alleviate this illness. Our primary problem, however, concerns itself with conditions of anoxemia which occur in aeroplane ascent, namely with acute oxygen deficiency. The ideal treatment of oxygen want is administration of oxygen in such percentage as will completely overcome the anoxemia (or lowered oxygen tension in the blood) produced. At 10,000 feet, the arterial blood may be 90 to

92 per cent saturated with oxygen, depending on the volume of breathing. In our opinion, aviators who are piloting planes at altitudes of from 10,000 to 12,000 feet should inhale oxygen from the start to the end of their flight. In this way their judgment is preserved to the peak of its efficiency and danger of accident is made less. Furthermore, the pilot himself is less apt to suffer from fatigue and from the recurring effects of oxygen want which appear to result in a special form of nervousness called by Armstrong "aeroneurosis."

The inhalation of 40 per cent oxygen will compensate for all altitudes which are apt to be met with in civil aviation, in the main altitudes of from 10,000 to 20,000 feet. Of special importance at the present time is the provision of an adequate supply of oxygen for aviators flying in military expeditions. The most recent practice appears to be the inhalation of oxygen in very high concentration, notably 100 per cent, especially for altitudes between 25,000 and 35,000 feet. In exposure to altitudes up to from 33,000 to 34,000 feet, the arterial blood is 95 per cent saturated with oxygen during the inhalation of pure oxygen. As the altitude increases from 35,000 to 40,000 feet, the arterial oxygen saturation falls to approximately 80 to 82 per cent. This degree of oxygen deficiency is comparable to that which a pilot might experience at 14,000 feet without oxygen. Unquestionably, there are signs of impairment of judgment at 40,000 feet even when breathing 100 per cent oxygen, but these are not sufficiently great to incapacitate him, and military objectives may be accomplished.

It would obviously be preferable to have his judgment unimpaired, if it were possible at this altitude. Research with this goal in mind is in progress. It does not appear that adding carbon dioxide to an oxygen enriched atmosphere increases the adaptation of individuals to very high altitudes. Although carbon dioxide stimulates the breathing and increases the dissociation of oxygen from hemoglobin, and also prevents alkalotic ischemia, the inhalation of 100 per cent oxygen appears to be better than mixtures of carbon dioxide and oxygen, in recent studies made in our laboratory. If an individual is breathing 2 per cent carbon dioxide in a mask at sea level, this percentage is increased in one-fifth of an atmosphere to 10 per cent carbon dioxide. In order to administer the equivalent of 2 per cent carbon dioxide at sea level to an individual at 40,000 feet, he would have to inhale approximately 10 per cent carbon dioxide and 90 per cent oxygen. In studies made in a low pressure chamber at the Aviation Research Laboratory in New York, we have seen no advantage from adding carbon dioxide. It must be borne in mind that the provision of 10 per cent carbon dioxide means a corresponding loss in the amount of oxygen inhaled; the subject breathes 90 per cent oxygen instead of 100 per cent. The increased ventilation which is stimulated by carbon dioxide does not apparently offset the loss in the mass of molecular oxygen inspired. Up to the present time, the best method of treating oxygen deficiency at very high altitudes is to supply oxygen in a concentration of 100 per cent. Physiological investigations are being carried out in the attempt to make possible a more normal oxygen tension to the tissues of the brain, heart and other organs, especially to the oxygen sensitive organs.

RECENT INVESTIGATIONS CONCERNED WITH RESISTANCE TO ANOXIA

Since military flying has been conducted at altitudes above 35,000 feet, at which anoxia inevitably takes place with its consequent impairment of mental and bodily function, we have been interested in the study of those factors which might increase resistance to oxygen want or decrease resistance to oxygen want.

A factor which decreases the resistance to anoxia was found to be excessive smoking. The smoke from cigarettes yields 1 per cent carbon monoxide by volume, from pipe tobacco 2 per cent, and from cigars about 6 per cent carbon monoxide. Thirty subjects were studied who inhaled the smoke of twenty cigarettes from the time of arising to about 3:30 in the afternoon. Approximately one-half of the subjects tested had a carbon monoxide saturation of between 5 and 10 per cent after smoking twenty cigarettes. The effect of carbon monoxide in displacing oxygen from hemoglobin has long been known. At sea level, this degree of carbon monoxide in the blood is probably not of much harm except in those individuals who are sensitive to carbon monoxide poisoning, or in patients who have latent or overt disease of the cardiac or respiratory systems. It seems likely in some individuals that the headache of the "morning after" may partly be due to carbon monoxide poisoning. However, in aviators who are flying at altitudes between 10,000 and 12,000 feet, without oxygen, or in those who are traveling above 35,000 feet, even with the inhalation of 100 per cent oxygen, this degree of carbon monoxide poisoning will tend to aggravate the anoxia caused by high altitudes.

The second factor which was studied was the effect of experimental thyroidectomy on rats. It was found that normal animals die at an altitude of 34,000 feet during a two hour exposure, whereas the animals who had had their thyroid removed were alive up to an altitude of 42,000 feet. This is an experimental demonstration of the fact that a lowered requirement of oxygen increases tolerance to high altitudes. It would seem likely that pilots whose basal metabolism is 20 per cent above normal would withstand very high altitudes less well than those whose basal metabolism was 20 per cent below normal. Furthermore, measures may be found which will make possible a temporary lowering of the oxygen consumption and if this turned out to be the case, these measures would make possible an ascent to higher altitudes than those now feasible. In addition, individuals who are to be exposed to very high altitudes should avoid undue stimulation of their metabolism before ascent to high altitudes, such as that produced by ingestion of a heavy protein meal.

Other investigations are in progress in the attempt to modify the physiology of man so that he may better adapt himself to very high altitudes, since this has become a military necessity. In addition, improvement in the type of oxygen apparatus used by the military combat flyer is sought for. In regard to the investigation of problems concerned with flying in military combat, it may be said that the knowledge gained in the pursuit of this type of evidence may also be of value later in civil aviation.

AEROEMBOLISM—"AIR BENDS"

The formation of bubbles in the tissues and blood of the body has been studied in deep sea divers. Small quantities of air bubbles may produce nothing more than itching in the skin, chest, abdomen, or ear. In other instances there may be present severe pain in the joints of the body, especially in the region of the knee. However, bubbles may be formed by the liberation of free nitrogen gas in the spinal cord, giving rise to weakness or even paralysis of the legs, or they may form in the lungs; in the latter instance, widespread dissemination of gas emboli in the pulmonary bed results in substernal pain and brings about asphyxia by obstruction of the capillaries and grave interference with oxygenation of the blood. With reference to the problem of "Air Bends," it has been recognized that a reduction of pressure from four atmospheres to one atmosphere is comparable, in the main, to a reduction from one atmosphere to one-quarter of an atmosphere, equivalent to an altitude of 33,700 feet. Haldane showed that the atmospheric pressure could be divided in half without causing bubble formation. Since he found that it was safe to have the absolute pressure, this meant that it would be as safe to decompress from eight atmospheres to four atmospheres as it is from two atmospheres to one atmosphere, or from one atmosphere to one-half an atmosphere. Thus, at an altitude of 18,000 feet, air bends would not be apt to take place. However, on ascent to altitudes of from 30,000 to 40,000 feet, air bends have been described which are similar to those that have been recorded in caisson disease.

In a slow ascent to high altitudes, the nitrogen in the body can gradually be eliminated by diffusing out of the blood in the lungs and then being expired. As a new supply of blood enters the lungs, the nitrogen under increased pressure (sea level) is eliminated progressively through the lungs. However, when the pressure of nitrogen in the body is more than double its normal saturation value, and ascent is made swiftly, the nitrogen gas may come out of solution and form bubbles to which may be added later some oxygen and carbon dioxide and water vapor. Those tissues of the body which have the poorest blood supply are the most likely sites for this formation of emboli. It has been shown that nitrogen is more soluble in fat, and that body fat at normal blood temperature dissolves about six times as much nitrogen as does the blood itself. From this it would appear that the blood would lose its nitrogen first, the protein tissues next and the fatty tissues last. The rate of the elimination of nitrogen has been charted by Behnke and is shown in Chart 8.

Since nitrogen bubbles appear at an ascent of more than 78 feet per minute, and since this slow rate of ascent is impracticable for military flying, aeroembolism has taken place with considerable frequency in pilots traveling at altitudes of from 30,000 to 40,000 feet. Fat individuals are said to be much more susceptible to attacks than are thin individuals, because of the increased solubility of nitrogen in fat. When pain in the joints occurs at high altitudes, the indication for treatment is an immediate descent to altitudes of from 15,000 to 20,000 feet, when the pain will disappear. Pain may also take place in other parts of the body and,

in some instances, burning sensations in the lung and pain in the chest will precede edema of the lungs. Paralysis has been reported at an altitude of 37,000 feet but this was temporary; descent to a lower altitude restored the subject to normal. The prognosis of aeroembolism in aviation is excellent, provided descent is undertaken immediately. However, in the case of a single member of a crew on a long mission, who may be isolated in the aeroplane and be unable to return to a lower altitude, permanent injury and even death may take place. Perhaps the greatest danger lies in the possibility that the pilot may suddenly become helpless and lose control of the aeroplane. In cases of severe aeroembolism, 100 per cent oxygen should be breathed, even after return to sea level atmosphere if any sign of the condition is still present.

The best method of preventing aeroembolism is to breathe oxygen for a period of two hours prior to ascent. This results in the gradual elimination of nitrogen (Chart 8) and makes the appearance of the bends much less likely. Another method of eliminating nitrogen is breathing mixtures of oxygen, 21 per cent, and helium, 79 per cent. This has found special favor in diving as it has made possible diving at deep pressures with maintenance of normal mental function. Air under pressures of four atmospheres is apt to produce a disordered mental state, due to the effect of the nitrogen molecule (Behnke).

Inhalation of 100 per cent oxygen appears to be preferable to that of helium-oxygen mixtures in so far as prevention of aeroembolism in aviation is concerned. Exercise increases the rate of elimination of nitrogen (Boothby and others). However, in military aviation it is not always practical to have the aviator inhale 100 per cent oxygen for two hours or more before ascending to high altitudes. At the present time, there is no other method of preventing aeroembolism.

The fact that oxygen is utilized by the tissues and is present in the blood, as discussed in the section on the oxygen dissociation curve, is the reason why aeroembolism could not take place primarily as a result of an oxygen bubble. Even during the inhalation of 100 per cent oxygen, the pressure of oxygen in the tissues themselves would be only about 60 mm. Hg. The oxygen physically dissolved under these circumstances would be 2 c. c. per 100 c. c. of blood, and after it was consumed the hemoglobin would then become deprived of an additional amount of oxygen, probably from 3 to 4 c. c. per 100 c. c. of blood passing through the tissues. The pressure of oxygen would fall in the tissues to that equal to venous blood, namely less than 60 mm. Hg. This is in contrast to nitrogen which is present in the tissues of the body at a pressure of approximately 515 mm. Hg. When a bubble has been formed by nitrogen coming out of solution, it is likely that oxygen will diffuse into it, as well as carbon dioxide and water vapor, since the pure nitrogen bubble will have no counteracting partial pressure of the other gases.

In the members of our group at the Aviation Research Laboratory, the symptoms of "air bends" has taken place in four of five people who have been exposed to altitudes of 40,000 feet, even though 100 per cent oxygen was breathed for three-quarters of an hour before exposure to the low pressure. It is probable

that a longer exposure to inhalation of 100 per cent would make the peril of aeroembolism less frequent. In laboratory investigations it is always possible to descend to the atmospheric pressure and thus immediately stop the symptoms.

PRESSURE DISTURBANCES IN THE PARA-NASAL SINUSES AND THE EAR

The middle ear and the frontal, ethmoid and maxillary sinuses connect with the nose, or the back of the throat, by passages which are ordinarily able to receive an interchange of air pressure without great difficulty. However, if these openings are closed by a swelling of the mucous membrane, such as might occur in an acute cold, there may be an increased pressure within the tube or sinus during ascent in an airplane. Under these circumstances, the air under increased pressure (for example, in the middle ear) is apt to push itself out through the eustachian tube. Some discomfort is experienced but the condition is not as severe as that which takes place when an individual comes down from a high altitude to sea level. Under these circumstances, the air within the middle ear is under decreased pressure, and if the pharynx is acutely inflamed, an infolding of the mouth of the eustachian tube takes place with obstruction to the entrance of air. As a consequence, the pressure on the inside of the tympanum becomes relatively less, in comparison to the pressure on the outside of the middle ear. In that event, pain and hemorrhage may take place and if the ear drum is forced in with a marked amount of pressure, rupture of the drum is produced. In most cases, the eustachian tube can be opened by repeated swallowings and yawnings, or, if necessary, by holding the nose tightly and compressing the cheeks with a closed mouth. Under certain circumstances if an equalization of pressure has not taken place and pain results, the individual may reascend to the high altitude where the pain first occurred and the pain will disappear. A slow descent may then result in a gradual equalization of pressure on two sides of the drum. In many cases, inhalation of helium-oxygen mixtures during descent, or afterward, causes relief of pain in the middle ear, since the smaller helium molecule may diffuse through the eustachian tube more easily than a molecule of nitrogen. The effect of pressure variations in themselves, such as from one-fifth of an atmosphere to 15 atmospheres, is probably negligible, provided that equalization of pressure takes place gradually in the air spaces of the ear and the sinuses, or any other region containing air.

EFFECT DUE TO CENTRIFUGAL FORCE

The effects of centrifugal force are produced by a change in the direction of motion, either upward or downward or to one side. It is believed that if man is adequately protected against the pressure of wind, he can withstand any velocity, provided that the aeroplane is traveling at a sufficiently constant rate and that the direction is not changed. We are moving all the time with the earth around the sun at a velocity of 12.4 miles per second without being aware of it, obviously because our surroundings are moving with us.

Acceleration may be defined as a change of velocity. When this change introduces stress, as in a linear or centrifugal change, a disturbance of a charac-

teristic nature may be produced. Since in Newton's law "F equals MA" then "A equals F divided by M." In other words, linear acceleration is proportional to force and inversely proportional to mass. Since weight constitutes a measure of the force of gravity and varies with the mass of the body, it has become convenient to view the force of gravity as a unit of measure for acceleration, which has been denoted by the symbol "G." Accelerations which produce forces upward on the airplane, perpendicular to its line of flight, have been called "positive accelerations" and those directed downward are called "negative accelerations." The most important effect of "acceleration" is retarding the return of blood to the heart. The direction of the force exerted on the body has a bearing on the magnitude of the effect, since the largest columns of blood appear in the great vessels entering the auricles.

When the return flow of blood is interfered with, the visual system, including the retina and the optic nerves, are particularly apt to be impaired since these mechanisms are especially sensitive to anoxia. The symptoms of "positive acceleration" have been described in terms of "G's." Thus, at 5 "G's," the body is beyond the control of the muscles except for slight movements of the arms and head. Coma takes place at from 6 to 8 "G's" and concussion is said to be produced at 20 "G's," or an acceleration of 640 feet per second acting for a fraction of a second. The most important factor appears to be the effect of hydrostatic pressure on the decreased filling of the heart. It has been shown by x-rays of monkey hearts that exposure to 5 and 7 "G's" results in an almost complete absence of the cardiac shadow, due to the failure of filling of the heart. The pathology of concussion is of considerable interest since some believe that the essential lesion is fat embolism of the finer cerebral blood vessels. Loss of consciousness would then be ascribed to anoxia of the cerebral tissues and be an additional reason for administering oxygen. The treatment of the dangerous effect of undue accelerations is largely to attempt to prevent it. Accelerations in the transverse axis of the body are least harmful, and if it were practical to place the pilot in a position perpendicular to the line of the aircraft's maximum force this would be an advantage. With positive acceleration, since the principal damaging effects are due to a drop in blood pressure and a loss of blood supply to the brain, anything which would increase this pressure would tend to overcome the ill effects. Tensing the abdominal muscles has been reported to be of some value. In addition, mechanically increasing the intra-abdominal pressure by a belt has been used and seems valuable. It is said that by means of a belt the tolerance of an individual for positive acceleration may be increased to 2 or 3 "G's." The best effect is obtained when the belt is inflated to a pressure of about 75 mm. Hg. for one-half minute before the exposure to the expected acceleration.

SUMMARY

Since engineers have made flying possible at altitudes above 50,000 feet and at speeds of more than 400 miles an hour, the physiology of man has been challenged in several important respects. We have reviewed the following physiological factors:

1. Oxygen Want.—The existence of impairment in mental functioning at altitudes of from 10,000 to 12,000 feet or over, is an indication for the continuous use of inhalation of 40 per cent oxygen at these altitudes. From 25,000 to 35,000 feet, inhalation of 100 per cent oxygen is advisable in civil as well as military aviation. Above 35,000 feet anoxemia persists even during the inhalation of 100 per cent oxygen, and above 40,000 feet dangerous disturbances in cerebral function may occur. Oxygen pressure suits have been impractical up to the present time for combat flying because of the degree of immobilization which they produce. The pressure cabin may be the ultimate answer for flying at very high altitudes, but at the present time few are in use. They suffer from the obvious danger that the slightest leak at altitudes of 40,000 feet or over would cause almost immediate unconsciousness due to anoxia, as well as the probable development of aeroembolism.

2. Air embolism may occur when the pressure is reduced more than one-half that of the atmosphere. In actual experience, signs of aeroembolism have appeared at barometric pressures equivalent to altitudes of from 25,000 to 35,000 feet, and more commonly at 40,000 feet, especially if the exposure to the lowered atmospheric pressure is prolonged. The most common symptoms are pain in the joints, especially the knee joint, and itching sensations in the skin. More dangerous symptoms are caused by emboli to the lungs, with chest pain and pulmonary edema, or emboli to the spinal cord, with paralysis of the extremities. The symptoms are generally relieved when the pressure is increased to that of the atmosphere or to that equivalent to an altitude of 18,000 feet. The best prophylactic treatment is the inhalation of 100 per cent oxygen for a period of two hours. Nitrogen desaturation is obtained more quickly when exercise accompanies the inhalation of pure oxygen.

3. A difference in pressure in the nasal sinuses and the outside atmosphere, or in the middle ear and the external atmosphere, may result in pain of the affected parts. During a swift ascent, the air in the eustachian tube generally is able to pass out of the orifice because of the increased pressure. However, in the presence of swelling of the mucous membrane, such as may occur in an acute cold, descent of the aeroplane rapidly causes a valve-like obstruction of the eustachian tube with marked increase in external pressure on the outside of the tympanum and a decreased pressure within the eustachian tube. Inadequate pressure neutralization during descent may cause pain, hemorrhage, or even perforation of the drum. The best method of treatment is gradual descent with repeated swallowings and yawnings, or forcible compression of the air within the oral cavity by blowing with the nose and mouth closed. Inhalation of 20 per cent oxygen and 80 per cent helium may be helpful during or after descent, since the smaller helium molecule may diffuse into the eustachian tube.

4. The effects of centrifugal force were mentioned briefly. A disturbance in consciousness and impairment of vision are apt to be the two most frequent symptoms. The limit of human endurance is a centrifugal force which has been described as 5 "G's" lasting for three seconds. Failure of the heart to fill with

blood is one of the most important results of the forces produced by positive acceleration. Wearing a special belt which causes increased pressure on the abdomen for a limited period of time appears to be of considerable help.

5. Patients with coronary artery disease should not travel at altitudes above 10,000 feet without continuously inhaling oxygen because of the possibility of precipitating precordial pain or cardiac failure. Patients with pulmonary emphysema and fibrosis may suffer a marked increase in dyspnea when traveling at these altitudes without oxygen. In patients who are being treated by pneumothorax, the expansion of the gas into the pleural cavity may produce symptoms of increased pressure and lead to untoward results.

6. Some of the physiological problems reviewed, which are now of special importance in military aviation, may become important in the civil aviation of the future, such as aeroembolism and the effects of centrifugal force as well as the consequences of severe anoxia. The spread of substratosphere flying in pressure cabins in commercial aviation will tend to reduce the occurrence of the symptoms of anoxia as well as the pressure disturbances in the middle ear and the accessory nasal sinuses, but the effects of a sudden loss of pressure will require special study in order that accidents of this nature will be rare and, if they do occur, be treated expertly.

Recent investigations in our laboratory have shown that resistance to oxygen want at high altitudes may be increased or decreased by altering the physiology of man. Thus, excessive inhaling of tobacco smoke may result in mild carbon monoxide poisoning which aggravates anoxia. Total removal of the thyroid in rats increased resistance to low barometric pressures; the majority of thyroidectomized animals survived at altitudes 8,000 feet higher than normal animals. There is an urgent need for studies which will reveal the mechanism of man's resistance to high altitudes and how it may be aided by physiological as well as mechanical means.

The swiftness with which high altitude flying has become a fact has confronted the physiologist and the physician with many new problems that need further investigation.

BIBLIOGRAPHY

Armstrong, H. G.: A Special Form of Psychoneurosis Appearing in Airplane Pilots. J. Aviat. Med., 106:1347, 1936.

Armstrong, H. G.: Anoxia in Aviation. J. Aviat. Med., 9:84, 1938.

Armstrong, H. G.: Principles and Practice of Aviation Medicine. Williams and Wilkins Co., Baltimore, 1939.

Asmussen, E. and Consolazio, F. C.: The Circulation in Rest and Work on Mount Evans (4,300 M). Am. J. Physiol., 132:555, 1941.

Barach, A. L.: "Pilot Error" and Oxygen Want. J.A.M.A., 108:1868, 1937.

Barach, A. L., Steiner, A. (with technical assistance of Eckman, M. and Molomut, N.): The Physiologic Action of Oxygen and Carbon Dioxide on the Coronary Circulation. Am. Heart J., 22:13, 1941. Also unfinished studies.

Barach, A. L., McFarland, R. and Seitz, C. P.: The Effects of Oxygen Deprivation on Complex Mental Function. J. Aviat. Med., 8:197, 1938.

Barach, A. L. and Eckman, M.: A Mask Apparatus Which Provides High Oxygen Concentrations with Accurate Control of the Percentage of Oxygen in the Inspired Air and Without Accumulation of Carbon Dioxide. J. Aviat. Med., March, 1941.

Barach, A. L., Eckman, M. and Molomut, N.: Modification of Resistance to Anoxia, with Especial Reference to High Altitude Flying. Am. J. M. Sc., 202:336, September, 1941. Also, Tr. A. Am. Physicians.

Barach, A. L. and Kagan, J.: Disorders of Mental Functioning Produced by Varying the Oxygen Tension of the Atmosphere. Psychosomatic Med., II, Jan., 1940.

Barach, A. L.: The Effect of Low and High Oxygen Tensions on Mental Functioning. J. Aviat. Med., March, 1941.

Barcroft, J.: The Respiratory Function of the Blood. I. Lessons from High Altitude. Cambridge Univ. Press, 207 pp., 1925.

Behnke, A. R.: High Atmospheric Pressures; Physiological Effects of Increased and Decreased Pressure. Ann. Int. Med., 13:2217, 1940.

Behnke, A. R. and Willmon, T. L.: Physiological Effects of High Altitude. U. S. Naval Medical Bulletin, 39: No. 2, 1941.

Bert, P.: La Presion Barometrique. Recherches de Physiologie Experimentalle, Paris, Masson, 1878.

Boothby, W. M., Lovelace, W. R. II, and Bulbelian, A. H.: (a) The Value of High Concentrations of Oxygen for Therapy. (b) Design and Construction of the Masks for the Oxygen Inhalation Apparatus. (c) An Apparatus for the Administration of Oxygen or Oxygen and Helium by Inhalation. Proc. Staff Meet., Mayo Clinic, 13:641, Oct. 12, 1938.

Boothby, W. M. and Lovelace, W. R. II: Oxygen in Aviation. J. Aviat. Med., Dec. 1938.

Boothby, W. M., Lovelace, W. R. II, and Benson, O. O.: High Altitude and Its Effect on the Human Body. J. Aeronautical Sc., 7:461, 1940.

Diringshofen, Heinz von: Medical Guide for Flying Personnel. Translated by Major V. E. Henderson, Univ. Toronto Press, 1940.

Grollman, A.: The Cardiac Output of Man in Health and Disease. Charles C. Thomas, Baltimore, 1932.

Haldane, J. S., Meakins, J. C. and Priestley, J. G.: The Respiratory Response to Anoxemia. J. Physiol., 52:420, 1919.

Haldane, J. S.: Respiration. 2nd ed., Yale Univ. Press, New Haven, 1935.

Lovelace, W. R. II, Boothby, W. M. and Benson, O. O.: Aeroembolism: A Medical Problem in Aviation at High Altitude. Scient. Monthly, July, 1941.

McFarland, R. A.: Psycho-physiological Studies of High Altitudes in the Andes:
1. The Effects of Rapid Ascent by Aeroplane and Train. J. Comp. Psychol., 23:191, 1937.
2. Sensory and Motor Responses during Acclimatization. J. Comp. Psychol., 23:227, 1937.
3. Mental and Psycho-somatic Responses during Gradual Adaptation. J. Comp. Psychol., 24:147, 1937.

McFarland, R. A. and Barach, A. L.: The Relationship between Alcoholic Intoxication and Anoxemia. Am. J. M. Sc., 192:186, 1936.

McFarland, R. A. and Barach, A. L.: The Response of Psychoneurotics to Variations in Oxygen Tension. Am. J. Psychiat., 93:1315, 1937.

McFarland, R. A. and Halperin, M. H.: The Relation Between Foveal Visual Acuity and Illumination Under Reduced Oxygen Tension. J. Gen. Physiol., 23:613 (May 20), 1940.

McFarland, R. A. and Forbes, W. H.: The Effects of Variations in the Concentration of Oxygen and of Glucose on Dark Adaptation. J. Gen. Physiol., 24:69 (Sept.), 1940.

Schneider, E. C. and Truesdale, D.: The Influence of Various Circulatory Conditions in the Reactions to the Low Oxygen of Rebreathing. Am. J. Physiol., 56:241, 1921.

Seitz, C. P.: The Effects of Anoxia on Visual Function. Arch. Psychol., Aug., 1940.

White, M. S.: The Effect of Anoxia in High Altitude Flights on the Electrocardiogram. J. Aviat. Med., Dec., 1940.

A Method of Selection of Medical Students Based on Previous Academic Grades and Medical Aptitude Scores*

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Is it possible to select medical students scientifically? This question is of serious concern to medical schools. If a limited number of students must be chosen from among many applicants, the school wants to choose the most promising. Even where limitation of numbers is not urgent, it would still be desirable to identify and refuse admission to those applicants who are certain to fail in the medical course. Scientific selection of students would greatly reduce the wastage of time, money and effort involved when students fail. The elimination of unsatisfactory students would enable the medical schools to give better tuition to the rest.

However desirable selection of medical students may seem, there are still many who doubt that it can be carried out with an acceptable degree of accuracy. One source of difficulty is the confusion between the problem of selecting individuals who will be successful medical students, and the problem of selecting those who will be good doctors. At the present time, the latter problem is difficult. We lack a clear-cut basis for distinguishing between good and poor doctors, and therefore cannot determine whether applicants for medical school possess the characteristics shown by good doctors or those of poor doctors. Obviously, annual income, prestige in the profession, or opinion of patients cannot be used as scientific criteria of differentiation. There is, however, an objective criterion of success in medical school, namely, academic grades. On the basis of grades one can distinguish good students from poor ones, and then proceed to search for measurable characteristics possessed in greater degree by good than by poor students. The method used in this investigation was designed to select individuals who will be successful medical students. It is not wholly unrelated to the other problem, for the first essential qualification for the practice of medicine is successful work in medical school.

The critics of selection point out the difficulty of isolating and measuring the factors determining success in medical school. These are numerous and complex. A list would certainly include ability, quality of previous academic work, quality of study habits, amount of work done, strength of motivation and interest, health and personality adjustment. "Supposing one could measure an applicant with respect to these factors," say the critics, "are they not likely to change?" Yes, obviously most of them can change. The student may become more interested. He may put forth more effort. He may learn better working habits. His health may improve. He may become better adjusted. To get an exact prediction of success in medical school would therefore be impossible. This does not mean that scientific selection is impossible. The object of research in selection methods

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is to make predictions which, though not entirely exact, will indicate the upper limit of achievement which can be expected of a student. This implies the possibility that certain of the factors are sufficiently fixed that a student identified as a potential failure will not turn out to be a highly satisfactory medical student. That this is so cannot be assumed; it must be demonstrated. A method of selection cannot lay claim to scientific validity unless students identified as being potentially unsuccessful are followed up throughout their career in medical school and actually found to be unsuccessful. Only by doing this can one allay the doubts of those who suspect that selection methods would bar from the medical profession potential Oslers and Bantings.

Scientific investigations of the factors affecting college grades have been numerous. Harris[1] reviews 328 investigations reported between 1930 and 1937. Of all the factors investigated, the two which have been found most generally to bear close relationship to college grades are previous academic grades and scores on tests of ability or aptitude. The review shows further that when previous academic grades are combined with a measure of ability, the combined score is more closely related to subsequent academic success than either separately. In 1931, Cowdery and Ewell[2] similarly reported that the combination of premedical grades and medical aptitude scores gave a better basis of predicting the success of 45 Stanford medical students than either alone. Preliminary investigations at the University of Toronto Faculty of Medicine indicated that a combination of previous academic marks and Moss aptitude scores were more closely related to medical grades than any other combination of two factors. Moreover, adding other factors did not significantly increase the degree of relationship. Therefore, the present investigation was limited to a consideration of previous academic grades and medical aptitude scores as a basis for selecting medical students.

THE UNIVERSITY OF TORONTO FACULTY OF MEDICINE

The University of Toronto Faculty of Medicine differs from other medical schools in certain ways which must be described before the methods and results of the investigation may be presented. At Toronto, the medical course and the premedical course are combined into one course covering six years. In the first year, the student is taught premedical sciences; in the second and third years he learns the basic medical sciences, and in the last three years he is trained in the clinical subjects. Students are admitted into the first year directly from high school. The Province of Ontario high schools give five years of training, the fifth year being considered equivalent to the first year of a general arts course at the University.

For admission to the first year of the medical course, the student must present certificates showing that he has passed the Ontario examinations in a specified number of high school subjects, or the equivalents from other provinces. A student is not refused admission on the grounds of mediocre high school grades,

1. Harris, D.: "Factors affecting college grades: a review of the literature, 1930-1937," Psychological Bull., 37:125-166, 1940.

2. Cowdery, L. M. and Ewell, B.C.: "Aptitude for Medical School Success," Faculty Bulletin, Stanford University, No. 19, 3-4, 1931.

even though he may have failed once or more before finally receiving passing grades in high school work. There is no numerical quota limiting the number of students admitted.

The problem of selection, thus, would be one of choosing from the high school graduates applying for admission those who are capable of handling the work of the medical course. The problem has become acute. In 1941, more than 200 students applied and were admitted to the first year. In recent years, from one-third to one-half of the students admitted to the first year have withdrawn or been failed out of the course. This elimination process extends over a number of years. In order to pass a given year, a student must receive an average grade of C, or 50 per cent, with not more than two grades of D. If he receives one or two D's he is permitted to proceed only if he passes supplemental examinations in those subjects. Should he fail a given year, he is permitted to repeat the work of that year. Should he fail again at the same year level he must withdraw. A student may technically spend two years at each level without being forced to withdraw. Actually, many students have wasted from one to seven years before finally withdrawing. With the object of more rapid elimination of unsatisfactory students, the Faculty, in 1937, raised the first year passing grade to B or 60 per cent. Beginning in 1938-1939, all students who failed to receive grade B in the first year were forced to withdraw without being given an opportunity to repeat.

SUBJECTS

Students entering first year medicine from 1937 to 1940 were the subjects of this investigation. The investigation was confined to those students who had Ontario high school certificates and Moss medical aptitude test scores. Those few students who withdrew from the course for reasons other than failure were not included. There were 473 subjects in all—108 entering in the fall of 1937, 110 entering in 1938, 130 entering in 1939 and 125 entering in 1940.

RELATIONSHIP OF HIGH SCHOOL GRADES TO MEDICAL GRADES

For freshmen, the appraisal of the quality of previous academic work is necessarily in terms of high school grades. Fortunately, a uniform examination system prevails in all the high schools of the Province of Ontario, so the grades of the Ontario students are strictly comparable. Although not included in the present report, the grades of the few students entering from outside of the Province can be equated fairly satisfactorily to Ontario grades. A definite positive relationship was found between high school grades and first year medical grades. That is, students who are good in high school tend to be good in first year medicine, while students who are poor in high school tend to be poor in first year medicine. The relationship is not close enough to permit of accurate prediction of first year grades from high school grades. There are a few notable exceptions—those who are good in high school but poor in first year medicine and vice versa. Preliminary studies of classes admitted before 1937 indicate that students entering with a B average or better have a 75 per cent chance of passing through the medical course without failure. Those entering with between a C+ and a B

average have about a 50 per cent chance of passing throughout. Those entering with lower than a C+ average have only a 15 per cent chance of passing throughout, while only 5 per cent pass without being conditioned in at least one year of the course.

One may account for the relationship between high school grades and medical grades as follows: Previous grades measure academic knowledge, which is important as a foundation for subsequent academic work. A student whose background of knowledge is weak will have greater difficulty with his medical courses than he would if he were well prepared. This is, however, but one of the reasons that previous academic grades are found to be related to college grades. The same factors that influence college grades have also influenced the previous grades, namely, ability, motivation, interest, study habits, etc. Thus previous grades provide a blanket measurement of many of the factors involved in success in medical school. In a few exceptional cases, there may be a marked change in some of these factors, and consequently a significant discrepancy between high school and college grades. Where there has been little change in these factors, one would expect to find a close degree of relationship between the grades in high school and medical school. Even where a student tries to change one of these factors, e.g., working habits, this adjustment cannot be made over night. Thus, in most cases, high school grades give a fairly good indication of the quality of work that can be expected in medical school, but they do not indicate a top limit of achievement to be expected of every individual.

RELATIONSHIP OF MEDICAL APTITUDE SCORES TO MEDICAL GRADES

The Moss medical aptitude test has been given to students in first year medicine at the University of Toronto since 1937. With the first three classes, the scores were definitely related to first year grades, but not closely enough for acceptably accurate prediction. For the class entering in 1940, the relationship was slight. With no class was the aptitude test as closely related to first year grades as were the high school grades. A University of Toronto medical aptitude test was also given in 1940. It gave better results than the Moss test, but since it is too soon to give a fair appraisal of its success, this report will be confined to the results of the Moss test.

The Moss test was first given in 1937 to a class which has now completed the fourth year of the course. This class was divided into four quarters according to aptitude scores. Of the quarter which received the highest aptitude scores, 78 per cent have passed four years of the medical course. Of the second highest quarter, 48 per cent have passed throughout. Of the second lowest quarter, 25 per cent have passed throughout. Of the lowest quarter, only 20 per cent have passed throughout, and only 10 per cent have passed four years without conditions. There were more exceptional cases of students with low aptitude scores passing throughout than there were of students with poor high school records passing throughout. There is no reason to suppose that the work of the fifth and sixth years will make much difference in these figures, for there have been no instances in the past 10 years of students failing in fifth or sixth years who have not failed previously.

The Moss medical aptitude test is a blanket measure of various abilities which seem to be related to success in medical school. General intelligence certainly enters into both the aptitude test scores and the medical grades. In addition, the aptitude test involves skills such as reading and comprehending difficult printed material, studying and remembering what has been studied, and the like. It uses scientific terminology and draws on scientific knowledge, giving the advantage to those who have been well prepared in the basic sciences. It overlaps somewhat with high school grades, for general intelligence and knowledge of the basic sciences enter into both measures. However, it obviously depends more on the general ability of the student than do high school grades. It is influenced less by the other factors making for success, such as motivation, health, personality adjustment, etc.

COMBINING HIGH SCHOOL GRADES AND APTITUDE SCORES TO PREDICT FIRST YEAR GRADES

It was believed that by combining high school grades and aptitude scores into a single value one might obtain a better prediction of first year grades than was given by either score alone. To combine these with proper weighting into a single value means more than to take both into consideration. A selection committee would have no difficulty where both scores are similar. That is, they could select students with both high school grades and aptitude scores above the average and reject students having poor scores in both. However, where one score is good and the other poor, the selection committee would require a weighted score to determine whether a student is good enough in one to compensate for the poor score in the other. A statistical formula[3] is available for determining the exact weight to give each of two factors to get the best prediction available from those two factors. After the formula was worked out for a class of first year students, it was possible to calculate from the aptitude score and the high school grade of each student a prediction of the grade received at the end of first year. The formula must be worked out first for a class for whom the first year grades are known. This was done for the 1937-1938 and 1938-1939 classes after they had completed the first year. To predict in advance the grades of each in a class of students, it is necessary to use the formula derived from a previous class, on the assumption that the classes will be sufficiently similar that no great error will be introduced. To make this assumption seemed justifiable, for the classes did not change greatly from year to year. The formulae derived from the 1937-1938 and 1938-1939 classes were combined and used to predict the grades of the freshmen students entering in 1939-1940. Then the formulae derived from the three preceding classes were combined and used to predict the grades of the 1940-1941 class.

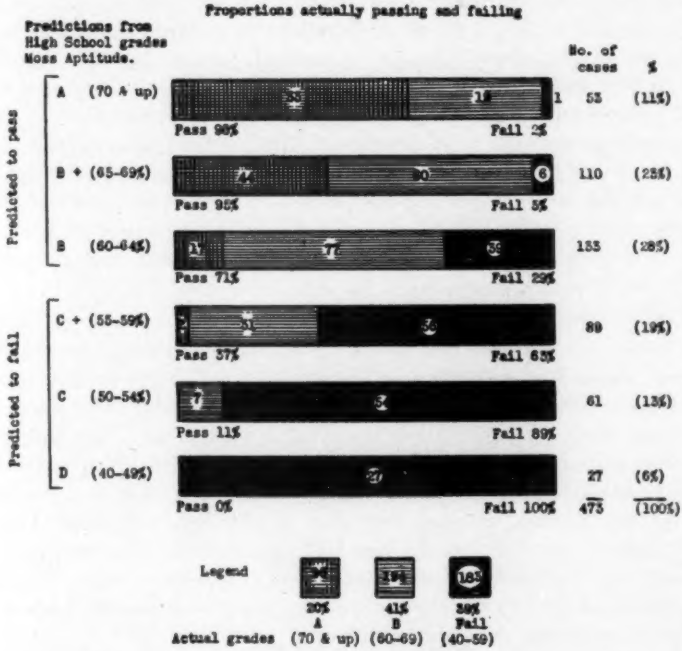
AGREEMENT BETWEEN PREDICTED AND ACTUAL FIRST YEAR GRADES

The combined and weighted score of high school grade and aptitude score was in the form of a predicted first year grade for each student. The accuracy of

3. The formula for the prediction, where X_1 is the predicted first year grade and X_2 and X_3 are the high-school grade and the aptitude score respectively, is: $X_1 = b_{12.3}X_2 + b_{13.2}X_3 + K$. The $b_{12.3}$ and $b_{13.2}$ and K values are derived from the means, standard deviations and correlation coefficients of the three items, high school grades, aptitude scores and first year grades. (See Garrett, H.E.: "Statistics in psychology and education," Longmans Green and Co. New York, 1939, p. 415.)

the prediction is judged in terms of how closely the predicted grade agrees with the actual grade obtained at the end of the first year. To check this, the 473 students were divided into six groups in terms of their predicted first year grades. The six groups were those predicted to get: (1) 70 per cent or over, or Grade A; (2) 65-69 per cent, or Grade B+; (3) 60-64 per cent, or Grade B; (4) 55-59 per cent, or Grade C+; (5) 50-54 per cent, or Grade C and (6) 40-49 per cent, or Grade D. The first three groups include all the students predicted to pass first year, and the last three groups include those predicted to fail. For each of these six groups was found the proportion which passed with Grade A or

CHART 1.—A COMPARISON OF THE ACTUAL AND PREDICTED FIRST YEAR GRADES FOR 473 MEDICAL STUDENTS



Grade B and the proportion which failed. In Chart I each group is represented by a horizontal bar. The size of the hatched portion of each bar represents the percentage of that group obtaining Grade A, the lined portion shows the percentage receiving Grade B, while the percentage who failed is shown in black. The numbers involved in the percentages are also marked on the bars. Underneath each bar is stated the percentages of that group passing and failing. The number of cases included in each group is listed to the right of the bars, together with the percentage each group forms of the total group of 473 subjects. A careful study of this chart gives a comprehensive idea of how well the predictions agree with the first year grades.

Of the 53 students predicted to obtain Grade A, 98 per cent passed and 2 per cent (one student) failed. Of those predicted to obtain Grade B+, 95 per cent passed and only 5 per cent failed. Thus, of the 163 students predicted to get well over the passing mark (65 per cent and up) all but a very few (7) passed. A considerable number of those predicted to get Grade A actually received Grade B, and many of those predicted to get Grade B+ actually received Grade A, but this does not indicate any serious lack of accuracy for purposes of selection.

The 27 students predicted to get Grade D actually did fail. Such students should certainly be barred from admission to medical school. Eighty-nine per cent (89%) failed of the students predicted to receive Grade C, whereas, only seven or 11 per cent, actually passed first year. Thus for the four most extreme groups the predictions work out well for the great majority of cases. The predictions are less accurate in differentiating between passes and failures for the two middle groups. This is to be expected, for a student with a predicted grade of 59.9 would be predicted to fail, and yet would pass if he received an actual grade of 60.0 which differs from the predicted grade by only 0.1. Of the 133 students predicted as borderline passes (Grade B), 71 per cent pass and 29 per cent fail. Of the 89 students predicted as borderline failures (Grade C+), 37 per cent pass while 63 per cent fail. Indeed, of the 296 students predicted to pass, 230, or 78 per cent, actually did pass first year as compared with 61 per cent of the total group of 473 students. Of the 177 students who were predicted to fail, 137, or 78 per cent, actually did fail first year as compared with 39 per cent of the total group.

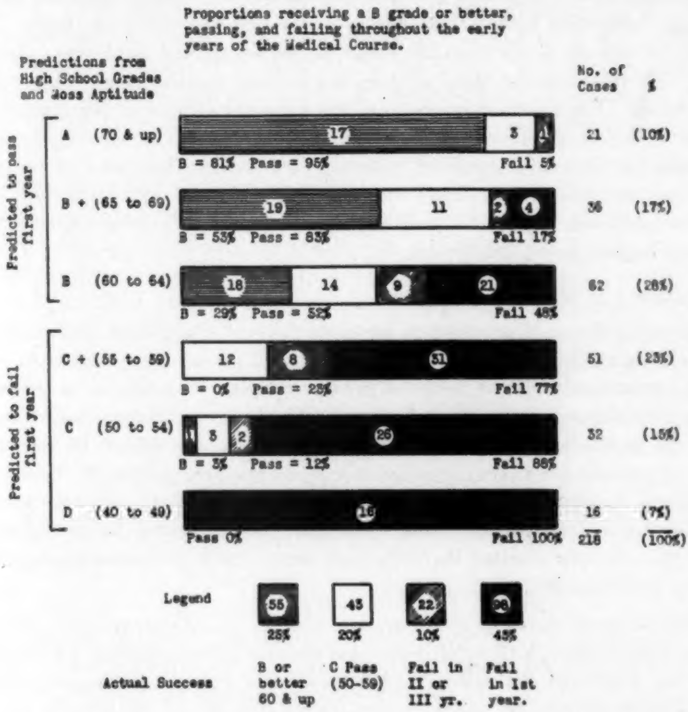
It is easy to explain why some students predicted to pass should happen to fail first year. Some of them did not do enough work, some were emotionally maladjusted, and others had outside jobs which interfered with their studies. In many cases, study habits which had been good enough to get a fair high school grade were inadequate for first year medicine. It is more difficult to explain why some of those predicted to fail should actually pass first year. Yet these are crucial cases for any selection program that aims to eliminate only those who are clearly unable to succeed. Perhaps these students succeed in first year by dint of hard work, but have not enough ability to succeed in subsequent years. To answer this question, a follow-up study was undertaken to see what actually happened to the students in second, third and fourth years.

AGREEMENT BETWEEN PREDICTED FIRST YEAR GRADES AND GRADES OF LATER YEARS

Unfortunately, none of the students to whom aptitude tests have been given have yet completed the six years of the medical course. The 1937 class has completed fourth year, and the 1938 class has completed third year. Since very few students fail for the first time in fourth, fifth or sixth years, the results for the first three years represent fairly adequately the results of the whole course as far as the differentiation between passes and failures is concerned. The 218 students entering first year in 1937 and 1938 were divided into six groups according to their predicted first year grades. In Chart 2 the lined portion of each bar

represents the percentage of that group who receive at least 60 per cent or Grade B on the average of the first three years' work. These are the only students doing really satisfactory work. The white portion of each bar represents the percentage who passed the first three years but with averages below 60. Such students usually are conditioned in one or more subjects. The hatched portion represents those who failed for the first time in second or third year, while the first year failures are shown in black.

CHART 2.—A COMPARISON OF THE PREDICTION AND THE ACTUAL SUCCESS OF 218 MEDICAL STUDENTS THROUGHOUT THE FIRST THREE YEARS OF THE COURSE



Most of the first group, who were predicted to get Grade A in first year, do well in the first three years of the course, 81 per cent receiving at least a Grade B average, 95 per cent passing and only 5 per cent failing. Of the second or predicted Grade B+ group, the proportion of failures is only 17 per cent, although the proportion of students receiving averages of Grade B or better is only 53 per cent. Almost one-half of the group predicted as borderline passes (Grade B or 60-64 per cent) have failed at some time during the first three years of the course, and only 29 per cent are doing really satisfactory work. Thus, even of the more promising students, a number have academic difficulties in the first three

years of the medical course. What of those who were predicted to fail? Of those predicted as borderline failures (Grade C+ or 55-59 per cent), 23 per cent are still passing, but none are doing satisfactory work with Grade B averages. Of those predicted to receive Grade C in the first year, six (12 per cent) are still passing, of whom only one received a Grade B average. Those predicted to obtain Grade D all failed in the first year.

To evaluate the success of the predicted first year grades as predictions of later work in the medical course, two crucial questions must be answered: (1) Did the predicted failures who passed first year continue to do satisfactory work in subsequent years? (2) Did the predicted failures who passed first year continue to pass subsequent years? The answer to the first question is decidedly "No!," as far as one can judge from the grades in the second and third year. Only one predicted failure passed the first three years of the medical course with a Grade B average. The fourth year grades of the predicted failures of the class of 1937 were all below the Grade B level. "Sometimes," is the answer to the second question. Fifteen other predicted failures passed the first three years of the course, but they scraped through close to the borderline, usually with conditions in one or two subjects. A selection program which barred such students from entering would impose no injustice.

DISCUSSION OF DISCREPANCY CASES

Despite the small numbers of predicted failures who passed, and despite the complexity of the factors possibly involved, I will hazard a generalization. Most of the discrepancy cases of predicted failures who pass first year are students with poor aptitude scores, who rarely have the ability to do satisfactory work throughout the medical course despite fairly good work at high school. A few of the discrepancies, however, had good aptitude scores but very poor high school grades. Although passing, these students have probably not learned adequate habits of application and study, since their subsequent work is of borderline calibre. It remains to be seen whether they will learn better habits in time to graduate with grades corresponding to their aptitude.

By no means do all of the promising students do satisfactory work in subsequent years, although Chart 2 shows that the better the prediction the better the chances of success. An analysis of the reasons for failure of promising students will provide material for another paper. Suffice it to say, for the present, that such students usually have high aptitude scores, although some have poor high school records. It is not through lack of ability that they fail. The explanation must be sought in other directions—poor study habits, difficulties in adjustment and the like. An alert and helpful faculty can salvage many of these students, particularly if the course is not cluttered up with a number of hopelessly unpromising students who demand help and attention. By giving enough help in time, many of the failures of promising students could be prevented. That this is likely is shown by a follow-up of the promising students who failed first year. The students who failed in 1937-1938 were permitted to repeat first year, although this policy was discontinued in 1938-1939. The repeaters who had high aptitude scores and

predictions of at least Grade B have, on the whole, done satisfactory work in the second and third years of the course. The students who failed first year in 1938-1939 had to transfer to other courses or withdraw from the University. Those who had high aptitude scores have done satisfactory work in the courses to which they transferred.

SUGGESTIONS FOR A SELECTION AND PROMOTION POLICY

The implications of this study for selection are clear. A prediction of 60 per cent, or Grade B, could be required for admission, thus eliminating two-thirds of the students who normally fail in the medical course, and yet eliminating very few, if any, capable of doing satisfactory work throughout the course. If any exceptions were made, the preference should be given to those with very high aptitude scores and poor high school grades, rather than to those with good high school grades and poor aptitude scores. With this precaution, it seems most unlikely that any students would be barred from admission who are potential medical geniuses.

This study would also indicate that the regulations controlling repeating could well be changed at the University of Toronto, to enable the maximum number of potentially successful students to continue throughout the course. Repetition of any one of the first three years of the course could be permitted, but only if the predicted first year grade and the aptitude score both promised future improvement. This would have two objects, first, to give the student with high aptitude and a poor high school record a second chance which he does not have under the present regulations, and secondly, to make it possible to eliminate students who prove to be incapable of successful work despite the fact that their predictions were over the Grade B standard. Some such students have low aptitude scores but are predicted to pass because very good high school work pulled the prediction up. Others have habits of negligence or unsystematic work or adjustment difficulties which have become so ingrained that they cannot be overcome even with expert counselling.

SUMMARY

A method of predicting academic success in the medical course has been devised and applied to four successive freshman classes, including 473 students in all. The high school grade and the medical aptitude score of each student were combined by a statistical formula to give a predicted first year grade. The predictions were found to be closely related to subsequent academic success. A student predicted to fail was found to have a very slim chance of doing successful work in the medical course, even though he may pass the first year. The predicted first year grade could be used as a basis of selecting medical students with little risk of serious injustice to the students thus eliminated. If all those with high aptitude scores were admitted, it seems certain that no potential medical geniuses would be barred from the medical course. Selection on this basis would very greatly reduce the number of failures in the medical course, particularly if supplemented by a good promotion policy and counselling program.

The Research Activities of the Preclinical Departments of American Medical Schools During 1940-1942

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Because research activity is closely correlated with teaching ability, it was thought appropriate to examine the preclinical departments of the American but especially of the Southern medical schools in this regard. The quality of faculty and student body now will influence the quality of the practice of medicine for the next generation or two. The clinical departments were not examined because clinical men spend from full time to almost none at all in the schools of medicine and conditions in this respect are not comparable in the various schools. The preclinical departments are on a full time basis and it is on them that most of the responsibility falls for teaching the fundamentals of medicine.

Two approaches to the research activities of the faculty members may be made: (1) the number of papers presented at the national societies in the respective preclinical fields, and (2) the number of publications in leading national journals. Because material was at hand, the first approach was used in the present study. The preclinical sciences are taken to include anatomy, pathology, bacteriology, immunology, physiology, biochemistry, nutrition, pharmacology and experimental therapeutics; tropical medicine and clinical pathology are not included because these are often taught in the clinical years. The number of papers presented at ten annual national society meetings (1-20) for 1940-1941 and 1941-1942 are tabulated (Table 1). The papers at these meetings must be original and papers read by title are included because members from distant schools sometimes cannot attend. The southern schools are in bold face type. Since only preclinical departments are included, the two year schools are on a par with the four year schools. If similar data for a five or ten year period were available, it would be possible to analyze schools by departments and individuals but a two year sample does not suffice for this.

Some schools with active clinical departments have weak preclinical departments and vice versa. The only conclusion is that the preclinical departments of our southern medical schools must be strengthened much more drastically than is now being done; otherwise the standards of medical practice in the South will fall far behind during the coming generation.

Table 1: Papers Presented Before Ten National Societies in the Preclinical Fields from Southern and Other Medical Schools for the Two Years, 1940 to 1942.

School	1940 1941	1941 1942	Avg.	School	1940 1941	1941 1942	Avg.
1. Chicago	71	42	56.5	41. Hahnemann	6	5	5.5
2. Harvard	60	41	50.5	42. **N. Carolina**	5	6	5.5
3. Yale	49	44	46.5	43. Oregon	6	5	5.5
4. Northwestern	57	36	46.5	44. South. Cal.	5	6	5.5
5. Cornell	49	31	40.0	45. Stanford	5	6	5.5
6. Pennsylvania	48	28	39.0	46. Buffalo	5	5	5.0
7. **Johns Hopkins**	35	38	36.5	47. Colorado	6	4	5.0
8. Wisconsin	38	30	34.0	48. **Louisville**	4	6	5.0
9. New York U.	31	35	33.0	49. **Maryland**	2	8	5.0
10. Minnesota	46	19	32.5	50. **Missouri**	6	4	5.0
11. Columbia	34	30	32.0	51. Indiana	5	4	4.5
12. Rochester	31	26	28.5	52. Marquette	5	4	4.5
13. Illinois	39	15	27.0	53. N. Y. Med. Col.	3	6	4.5
14. Western Res.	24	26	25.0	54. Queens	3	6	4.5
15. Michigan	24	22	23.0	55. Nebraska	4	4	4.0
16. Wayne	26	18	22.0	56. **Arkansas**	5	2	3.5
17. California	18	25	21.5	57. **Med. Col. Va.**	3	4	3.5
18. **Duke**	21	17	19.0	58. **Oklahoma**	3	4	3.5
19. Iowa	16	16	16.0	59. **West Virginia**	3	4	3.5
20. **Louisiana St.**	13	13	13.0	60. Womans Med.	4	3	3.5
21. Washington U.	16	9	12.5	61. **Emory**	3	3	3.0
22. **Alabama**	11	13	12.0	62. Long Island	3	3	3.0
23. Cincinnati	16	8	12.0	63. Vermont	3	3	3.0
24. Toronto	17	7	12.0	64. Chicago Med.	2	3	2.5
25. **Vanderbilt**	14	8	11.0	65. **S. Carolina**	1	4	2.5
26. Boston	7	14	10.5	66. Syracuse	5	0	2.5
27. Pittsburgh	7	14	10.5	67. **Tulane**	2	3	2.5
28. McGill	7	13	10.0	68. **Wake Forest**	2	3	2.5
29. St. Louis	10	8	9.0	69. **Baylor**	2	2	2.0
30. **Tennessee**	11	6	8.5	70. Creighton	3	1	2.0
31. **Virginia**	10	7	8.5	71. Howard	1	2	1.5
32. Kansas	12	4	8.0	72. Tufts	1	1	1.0
33. Temple	8	8	8.0	73. S. Dakota	2	0	1.0
34. Ohio State	10	5	7.5	74. U. Washington	1	1	1.0
35. **Texas**	14	1	7.5	75. George Wash.	1	0	0.5
36. Albany	10	4	7.0	76. **Mississippi**	1	0	0.5
37. Jefferson	7	7	7.0	77. N. Dakota	1	0	0.5
38. Loyola	8	6	7.0	78. Dartmouth	0	0	0.0
39. Georgetown	6	6	6.0	79. Med. Evangl.	0	0	0.0
40. **Georgia**	6	6	6.0	80. Utah	0	0	0.0

Note: Seven additional Canadian schools averaged as follows: Dalhousie, 2.5; West. Ontario, 2.0; and Alberta, Manitoba, Montreal, Laval and Saskatchewan, 0.0 each.

BIBLIOGRAPHY

1. Proc. Soc. Am. Bacteriologists, 42nd General Meeting, St. Louis, Dec. 27-29, 1940. (Sect. M. Bact., Immunol. and Comp. Pathol.).
2. Proc. Am. A. Immunologists, 28th Annual Meeting, Chicago, April 16-17, 1941.
3. Proc. Soc. Am. Bacteriologists, Sect. M. Bact., Immunol. and Comp. Pathol., 43rd General Meeting, Baltimore, Dec. 29-31, 1941.
4. Proc. Am. A. Immunologists, 29th Annual Meeting, Boston, April 2, 1942.
5. Proc. Am. Physiological Society, Annual Meeting, Chicago, April 15-19, 1941.
6. Proc. Am. Soc. Biological Chemists, Annual Meeting, Chicago, April 15-19, 1941.
7. Proc. Am. Soc. for Pharmacology and Experimental Therapeutics, Inc., Annual Meeting, Chicago, April 15-19, 1941.
8. Proc. Am. Soc. for Experimental Pathology, Annual Meeting, Chicago, April 15-19, 1941.
9. Proc. Am. Institute of Nutrition, Annual Meeting, Chicago, April 15-19, 1941.
10. Proc. Am. A. for Cancer Research, Inc., Annual Meeting, Chicago, April 15-19, 1941.
11. Proc. Am. A. Pathologists and Bacteriologists, 41st Annual Meeting, New York, April 10-11, 1941.
12. Proc. Am. A. of Anatomists, 57th Annual Meeting, Chicago, April 9-11, 1941.
13. Proc. Am. Physiological Society, 54th Annual Meeting, Boston, March 31-April 4, 1942.
14. Proc. Am. Society of Biological Chemists, 36th Annual Meeting, Boston, March 31-April 4, 1942.
15. Proc. Am. Soc. for Pharmacology and Experimental Therapeutics, 35th Annual Meeting, Boston, March 31-April 4, 1942.
16. Proc. Am. Soc. for Experimental Pathology, 30th Annual Meeting, Boston, March 31-April 4, 1942.
17. Proc. Am. Institute of Nutrition, 9th Annual Meeting, Boston, March 31-April 4, 1942.
18. Proc. Am. A. of Pathologists and Bacteriologists, 42nd Annual Meeting, St. Louis, April 2-3, 1942.
19. Proc. Am. A. for Cancer Research, Inc., 35th Annual Meeting, Boston, March 31-April 1, 1942.
20. Proc. Am. A. of Anatomists, Annual Meeting, 58th Session, New York, April 1-3, 1942.

Report of the Committee on Aptitude Tests for Medical Schools

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During the past year (1940-1941) two forms of the medical aptitude test have been administered by our Committee. The second test was necessitated by a change in the date for giving the test. For a number of years, the test had been given during the first semester; first in December, and since 1938 in November. However, due to the tendency on the part of most of the medical schools to select their classes earlier each year, a number of schools had requested that it be given in the late spring so that the results might be available for the admission officers at the opening of the fall term for selection of the freshman classes for the following year. At the 1940 meeting of the Association of American Medical Colleges the change in date was decided on, and Form 15 of the test was taken on May 1, 1941, by the 1942 applicants. Form 14 had been administered to the 1941 applicants on November 8, 1940. Using these two forms, a total of 17,956 tests were given during the fiscal year, September 1, 1940 to August 31, 1941.

TABLE 1.—SUMMARY OF TABULATIONS OF FORMS 14 AND 15.

FORM 14

Test	Name of Part	Total Points Possible	Distribution of Scores Q_3	M	Q_1
1.	Comprehension and Retention	90	79	69	59
2.	Visual Memory	25	21	16	12
3.	Memory for Content	25	15	11	7
4.	General Information	90	55	45	36
5.	Understanding of Printed Material	45	38	32	24
6.	Scientific Vocabulary	90	74	58	39
7.	Logical Reasoning	25	15	9	0
	TOTAL	390	272	234	196

FORM 15

Test	Name of Part	Total Points Possible	Distribution of Scores Q_3	M	Q_1
1.	Visual Memory	20	14	11	8
2.	Memory for Content	30	22	18	14
3.	Memory for Content	20	16	14	11
4.	Scientific Vocabulary	50	36	30	24
5.	Scientific Definitions	50	50	49	43
6.	Understanding of Printed Material	45	38	32	23
7.	Premedical Information	100	57	45	32
8.	Logical Reasoning	40	31	25	15
	TOTAL	355	242	213	180

The various individual tests making up Form 14 and Form 15 are shown in Table 1 together with a summary of the tabulations of the scores earned on each of the separate tests and the total scores.

The highest score made on Form 14 was 372 and the lowest 40, while 321 was the highest score made on Form 15 and 46 the lowest.

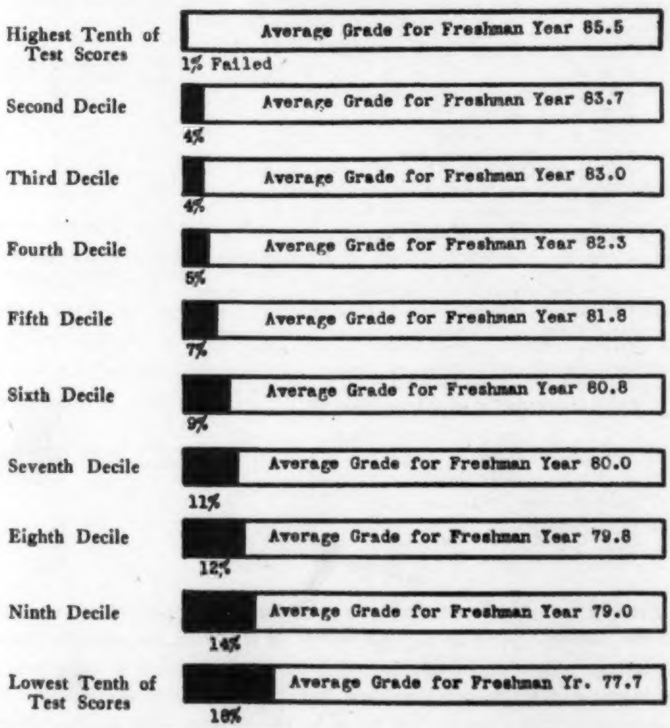
During the summer of 1941, we made an analysis of the success with which Form 13 of the medical aptitude test predicted the medical school grades of the 1940-1941 freshman classes. For the third consecutive year, more than nine-

TABLE 2.—COMPARISON OF APTITUDE TEST SCORES OF STUDENTS ADMITTED (FALL 1940) WITH THOSE OF TOTAL GROUP TESTED

	All Applicants	Students Admitted
Highest 10 per cent made score above	308	314
Highest quarter made score above	278	289
Median score was	240	256
Lowest quarter made score below	200	220
Lowest 10 per cent made score below	166	187

tenths of the freshmen had taken the test. It is interesting to compare the test scores of these students with the scores of the ten thousand students who took Form 13 in November, 1939.

MEDICAL SCHOOL PERFORMANCE AT VARIOUS TEST SCORE LEVELS
FRESHMEN 1940-1941



The median of all those admitted had a percentile rank of 61 as compared with a percentile of 50 for the whole group tested. This places the average student admitted 11 percentile points above the average of all those tested.

The chart shows the achievement of the 1940-1941 freshman classes divided into ten equal groups on the basis of their scores on the Aptitude Test. In this we see a marked contrast between the attainments of students falling in the upper tenths of test scores and those falling in the lower tenths. There is a gradual decline in the average grade from the highest to the lowest tenth and a corresponding increase in the percentage of failures.

During the past summer some further detailed studies of the separate parts of three forms of the medical aptitude test (Forms 4, 7 and 8) were made. All of the various parts of these forms were studied carefully in an effort to determine which have the higher predictive value. Undoubtedly, the best criterion of desirability of a part of the aptitude test is its relationship to the grades made in the medical school by those who take the test. This is illustrated in Table 3 in terms of percentage of failures predicted and percentage of good people who would be excluded by the various parts, were we to set critical points that would exclude the lowest quarter on each part.

TABLE 3.—FAILURES PREDICTED BY SEPARATE TESTS OF THREE FORMS OF THE MEDICAL APTITUDE TEST

FORM 4

	Percentage of Failures Predicted	Percentage of High Grades Excluded
Test 1 Comprehension and Retention	45	12
Test 2 Visual Memory	40	15
Test 3 Memory for Content	41	18
Test 4 Premedical Information	45	8
Test 5 Vocabulary	45	8
Test 6 Directions	26	12
Test 7 Understanding of Printed Material	37	14

FORM 7

	Percentage of Failures Predicted	Percentage of High Grades Excluded
Test 1 Comprehension and Retention	39	9
Test 2 Visual Memory	32	14
Test 3 Memory for Content	31	15
Test 4 Spelling	41	15
Test 5 Logical Reasoning	31	14
Test 6 Scientific Vocabulary	45	9
Test 7 Understanding of Printed Material	38	14

FORM 8

	Percentage of Failures Predicted	Percentage of High Grades Excluded
Test 1 General Information	46	15
Test 2 Scientific Vocabulary	37	12
Test 3 Spelling	33	15
Test 4 Logical Reasoning	37	13
Test 5 Understanding of Printed Material	41	14

Another method which we used in approaching the problem of the relative value of the different parts of the test is that of studying the separate questions or items in respect to their ability to select the good students as compared with the poor ones. A separate question on a test is valuable for our purpose if the wrong answers to this question are given by the persons who do poor work in medical school and the correct answers by those who do good work. This was done by dividing the students into three groups on the basis of their medical school work, the highest, middle and lowest third, then tabulating their errors

on the separate questions from their aptitude test papers. The ratio of wrong answers in the lowest third to wrong answers in the highest third gives us a "selective" value for each question. Owing to the fact that some of the more satisfactory items will probably be used in some future forms, it is not advisable to publish any of the detailed results of this analysis.

TABLE 4.—MEDIAN SCORES ON FORMS 7 AND 8 OF THE APTITUDE TEST OF STUDENTS DIVIDED INTO HIGH, MIDDLE AND LOW GROUPS ON THE BASIS OF FRESHMAN MEDICAL SCHOOL GRADES

FORM 7

Test	High Group (Av. 85 and above)	Middle Group (Av. 80-84)	Low Group (Av. 79 and below)
1	25.8	23.2	21.2
2	17.2	16.1	14.5
3	9.1	8.3	7.0
4	28.2	25.6	22.9
5	22.6	20.8	17.8
6	76.2	70.9	65.2
7	14.8	11.3	9.2
Total Score	188.5	165.7	148.5

FORM 8

Test	High Group (Av. 85 and above)	Middle Group (Av. 80-84)	Low Group (Av. 79 and below)
1	72.3	67.4	61.4
2	74.0	68.2	64.8
3	30.6	29.0	27.4
4	26.3	22.8	20.9
5	50.0	42.8	35.3
Total Score	246.7	227.6	207.5

For Forms 7 and 8 we also made tabulations from the test papers of scores on the separate tests and of total scores for the groups as shown in Table 4. From the fact that in every test the median score of those making high averages in medical school is distinctly higher than that of the group averaging from 80 to 84, while the latter, in turn, surpasses the group with the low scholastic averages, it is evident that the test predicted success in medical school with a fair degree of accuracy.

A Statement of Policy for the Development of a Curriculum for a University Medical School

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1. To what end are we training medical students?

   A. To protect the general health: by producing sufficient

      (a) General practitioners

      (b) Health officers

      (c) Teachers of special aptitude

      (d) Research workers

      Of these not more than 1 per cent will become effective research workers. A lot of time, effort and money are wasted in badly done, needless or repetitive research.

2. What pattern of planning promises the probability of most effective training? Recognition that:

   A. That medicine is applied biology.

   B. That the fundamental biological directing principle is, that to survive and to live effectively, living organisms must

      (a) Adapt through their own inherent mechanisms to the conditions of their various environments.

      (b) That materials for the understanding of these mechanisms are included in the fields of study classed together as physiology and psychology.

      (c) That it is necessary for a physician to understand not only the mechanisms of the adapting organism but equally the events and objects within the environment to which the organism must react and adjust. These objects and events may be physical, human, psychological, social or economic.

3. What further directing pattern can we find in this conception?

   A. That human health is an expression of full and economical adjustment to the objects and events of human environment, including in particular other human beings and their actions.

B. That ill health expresses maladjustment of the human organism to its environment; the maladjustment may be physical, physiological or psychological.

C. That the human organism as born is endowed with potential reactivities, physiological and psychological; and mechanisms through which the body, for its benefit, brings about adjustments that serve its needs for survival, efficient action and comfort.

D. In the medical curriculum, the study of such mechanisms is assigned, the physiological, to the discipline Physiology with its subdivisions—anatomy, including morbid anatomy (pathology), biochemistry, including the chemistry of abnormal physiological processes (pathology) and clinical medicine; the psychological to Psychology and Psychiatry.

E. The aim of these disciplines is, through studies and researches in the fields peculiarly their own, to acquire knowledge and understanding of these many and various mechanisms and to relate their findings fruitfully to those of every other field; and to do this in such a way that it will become possible for men so trained to

(a) Recognize maladjustments of whatever kind

(b) To remove hindrances to readjustment, to the environment

(c) Be able to devise means by which irremediable maladjustments may be made tolerable to the maladjusted, with the maximum potential efficiency.

F. These aims are to be furthered by the perfection of techniques, diagnostic and therapeutic, derived from the knowledge and insight acquired through such studies and researches.

4. From these considerations it follows that the curriculum in medicine must concern itself not only with the natural history of disease and of health but with an introduction of the student to an immense range of techniques; preventive, diagnostic, therapeutic and administrative in the fields of medicine, surgery, psychiatry and public health.

5. These techniques are so many, the curricular hours so few, and the limitations of the human mind so narrow, that no student can be expected to gain more than a nomenclature and an orientation in this region of complexities. It is to be hoped that some practical way can be devised which will make it

possible for fourth year students to narrow their fields of technical training so that those who intend to specialize, and who have chosen their specialty, in one of the various subfields medicine, surgery and public health have to offer, may be able to go on to their fifth year having had an introduction to the essential techniques necessary in the field of their choice.

6. Time and effort might be saved if those responsible for teaching various courses would unite in indicating various textbooks, or series of articles from the current literature, or a specially prepared syllabus which would contain the information for which the students of those courses would be held. Under this plan there need be no didactic lectures; these could well be replaced by seminars at which one or more instructors meeting the students could extend the textbook information and correct any items which were felt to be incorrect or misleading.

7. There is little doubt that instruction, at least for some students, might be bettered if departments encouraged instructors and students to take advantage of the preceptor system.

8. It has been suggested that a fifth year be no longer required. This might be a step warranted during the present national emergency with its urgent need for 7,000 new physicians at once and for 17,000 within a few years. However, so far as desirable medical education goes, the step would be deplorable.

Accelerated Course at the University of Toronto

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The acceleration of the medical course at the University of Toronto to meet the shortage of doctors for the Armed Forces and for civilian needs was decided on in the spring of 1941. The proposed curriculum consisted in lengthening the academic session from 7½ to 10 months in all years of the course except the first year, which consists of premedical subjects.* This procedure will result in graduating a class of students every eight months instead of every twelve months as at present.

CHART I—UNIVERSITY OF TORONTO MEDICAL COURSE—GRADUATION, INTERNSHIP, MILITARY SERVICE

1941-42	Graduation	Internship	Available for Military Service	
			Speeded up Course	Regular Course
Sixth Yr.	Apr. 30, 1942	May 1, 1942 to Dec. 31, 1942	Jan. 1, 1943	July 1, 1943
Fifth Yr.	Dec. 31, 1942	Jan. 1, 1943 to Aug. 31, 1943	Sept. 1, 1943	July 1, 1944
Fourth Yr.	July 30, 1943	Sept. 1, 1943 to Apr. 30, 1944	May 1, 1944	July 1, 1945
Third Yr.	Apr. 28, 1944	May 1, 1944 to Dec. 31, 1944	Jan. 1, 1945	July 1, 1946
Second Yr.	Dec. 31, 1944	Jan. 1, 1945 to Aug. 31, 1945	Sept. 1, 1945	July 1, 1947

As it has been considered essential that each graduate should have a period of internship in a hospital in order to round out his education, either to begin private practice or to become a medical officer in the Armed Forces, the hospitals were asked if they would shorten the internship period from 12 to 8 months in order that medical officers might be made available for military service in as short a time as possible and at the same time provide for the coordination of the internship period with the graduation of students every eight months. Provincial licensing bodies were requested to permit the medical curriculum to be completed in a shorter time than their regulations require. Both the hospitals and licensing bodies agreed to the proposed changes as a war measure.

*At Toronto, the second, third, fourth, fifth and sixth years correspond to the first, second, third and fourth years of the medical course in the United States.—Ed.

The accelerated curriculum at Toronto came into operation when the second to the sixth year classes registered on August 25, 1941, the effects of which are shown in the chart.

As the result of this speeded up curriculum, the sixth year class will take the place of the present class of interns in hospitals on May 1st instead of July 1st, making them available for military service two months earlier than would ordinarily be the case.

The present sixth year class will be available for the Armed Forces on Jan. 1, 1943, instead of July 1st, or six months sooner; the fifth year class will be available ten months earlier; the fourth year class, fourteen months earlier, the third year class, eighteen months earlier and the second year class, twenty-two months earlier.

The curricular changes in the courses of each of the years have only been of a minor character, the time tables in each year consisting of the three terms of the present course to which has been added the first term of the next succeeding year in the fourth term from April to June. The total length of the actual instruction is such that each student receives practically the same sound medical training as in the regular course, but in a shorter period of time.

PRELIMINARY PROGRAM

FOR THE

FIFTY-THIRD ANNUAL MEETING

OF THE

ASSOCIATION *of* AMERICAN MEDICAL COLLEGES

TO BE HELD IN

LOUISVILLE, KENTUCKY

OCTOBER 26, 27 AND 28, 1942

(The order of the papers as listed is subject to change. The official program will give the proper order.)

Address of the President.

DR. LOREN R. CHANDLER, *Dean*,
Stanford University School of Medicine.

Address.

COLONEL LEONARD G. ROUNTREE, *Medical Advisor*,
Selective Service System, United States of America.

Teaching of Public Health and Preventive Medicine.

Report of Committee: DR. H. S. MUSTARD, *Chairman*, Columbia University; DR. JOHN GORDON, Harvard University; DR. CHAS. E. SMITH, Stanford University; DR. HUGH R. LEAVELL, University of Louisville.

Discussion opened by:

DR. W. S. LEATHERS, *Dean*,
Vanderbilt University School of Medicine.

Teaching of Tropical Medicine.

Report of Committee: DR. HENRY E. MELENEY, *Chairman*, New York University;
DR. MAXWELL LAPHAM, Tulane University of Louisiana;
DR. MALCOLM SOULE, University of Michigan.

Discussion opened by:

C. SIDNEY BURWELL, *Dean*, Harvard University, and
DR. JEAN A. CURRAN, *Dean*, Long Island College of Medicine.

Teaching of Military Medicine.

Report of Committee: DR. EDWIN P. LEHMAN, *Chairman*, University of Virginia;
DR. CURRIER McEWEN, New York University, and
DR. H. S. MUSTARD, Columbia University.

Discussion opened by:

DR. GEORGE PACKER BERRY, *Assistant Dean and Professor of Bacteriology*,
University of Rochester School of Medicine.

A Study of the Curriculum Under the Accelerated Program.

Report of Committee: DR. VICTOR JOHNSON, *Chairman*, University of Chicago;
DR. F. H. SWETT, Duke University and
JAMES A. GREENE, State University of Iowa.

Medical Research in Wartime.

DR. E. COWLES ANDRUS, *Assistant to the Chairman*,
Committee on Medical Research of the National Research Council.

Finger Printing of Medical Students.

DR. MAURICE H. REES, *Dean*,
University of Colorado School of Medicine.

Coordinating Program of Health, Hospital and Medical School in a Municipal University.

DR. HUGH R. LEAVELL, *Professor of Public Health and Bacteriology*,
University of Louisville School of Medicine.

The Teaching of Psychiatry to Undergraduate Medical Students.

DR. S. SPAFFORD ACKERLY, *Professor of Psychiatry*,
University of Louisville School of Medicine.

Teaching of Obstetrics.

DR. FREDERICK H. FALLS, *Professor of Obstetrics and Gynecology*,
University of Illinois College of Medicine.

Discussion opened by:

DR. EVERETT D. PLASS, *Professor of Obstetrics and Gynecology*,
State University of Iowa College of Medicine.

Teaching of Nutrition.

DR. RUSSELL M. WILDER, *Professor of Medicine*,
Mayo Foundation, University of Minnesota.

Discussion opened by:

DR. A. W. HOMBERGER, *Professor of Biochemistry*,
University of Louisville School of Medicine.

The Internship Under the Accelerated Program.

DR. ROBIN C. BUERKI, *Dean*,
University of Pennsylvania Graduate School of Medicine.

Discussion opened by:

DR. ARTHUR C. BACHMEYER, *Director*,
University of Chicago Clinics, *Associate Dean*, School of Medicine.

DR. ALLEN O. WHIPPLE, *Valentine Mott Professor of Surgery*,
Columbia, University.

DR. EDWARD C. ELLIOTT, *Chief*, Professional and Technical Personnel Division of the War Manpower Commission, will address the meeting, and a Representative of the Procurement and Assignment Service will also speak. DR. FRANK H. LAHEY, *Chairman*, will appoint this representative.

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The Louisville Meeting

The fifty-third annual meeting of the Association of American Medical Colleges will be held in Louisville, Kentucky, October 26-28, 1942. Headquarters: The Brown Hotel, where all program sessions and the executive session will be held. All those concerned with or interested in medical education are cordially invited to attend this meeting.

The program (published elsewhere in this issue) concerns itself, in the main, with matters connected with the accelerated program, initiated as a war measure, and subjects which bear directly on the education of physicians for government service during the war. The Army and Navy medical departments have stressed the need for more teaching of military medicine, tropical medicine, preventive medicine, nutrition. All these subjects will be discussed in papers to be presented by men who have given careful thought to them.

Representatives of Procurement and Assignment Service, Selective Service, research in war, will be present to speak on these topics which, no doubt, will give aid and comfort to the deans of the medical colleges. The rapidly expanding efforts made to help to increase the supply of physicians for government service have entailed many perplexing problems which must be solved under unusual conditions, such as, particularly, depleted teaching personnel. Much light, and help, can be furnished by these representatives of important government agencies dealing with medical personnel.

Therefore, this meeting must be regarded as promising to be one of the most important meetings ever held, and a large attendance is most desirable and urgently needed. Those who plan to attend the meeting are urged to make hotel reservations early. Dr. John Walker Moore, Dean University of Louisville School of Medicine, is the chairman of the local committee.

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Imminent Closure of Medical Colleges

A number of medical colleges find themselves faced with closure because of the depletion of their faculties, particularly in the clinical departments, by entrance into government medical services. This danger must be met and overcome. There is every willingness—as has been shown—to operate with a large shortage of personnel, but a complete lack of teaching personnel makes it impossible to carry on. The number of physicians required by the government necessarily is large—but even if every faculty member were inducted into service, it would be as a drop in the bucket. After all, the total number of teachers in all the medical colleges of the United States is approximately 17,000 and about 5,000 of these are not medical men.

True, every man, especially the physician, is eager to do his duty by serving his country at all times and especially in time of need, such as this, but since medical colleges are the only source of supply of physicians, they must be helped to continue to operate. The accelerated program adopted by nearly all medical colleges will give an additional supply of about 5,400 physicians over a three year period, but there must be assurance of continued operation. Men who hold a commission in the army or navy are subject to call. If they resign from the service, they can continue to teach but there is the fear of the stigma of not being

patriotic or of being "yellow." Even not to ask for a commission hurts self pride. There must be a way out to conserve the service medical colleges are trying so hard to give.

Would it not be well to furnish needed, "essential," teachers—who are more than willing to enter service—an insignia, perhaps, a button or a ribbon, to show that they have remained on the job because that service is as important in the war effort as actual service with troops? Every medical college should discuss this problem seriously with its faculty and point out the urgent need of, at least, a skeleton teaching force. No one objects to doing more work, spending more hours, making greater effort to help out in this great, serious national emergency —but there are many ways of rendering important service besides being in the field or combat zone.

Perhaps the government has not been appraised of this critical situation. Naturally, government must seek medical aid wherever it can be gotten, but the real source of supply of that aid, the medical college, must be conserved. The civilian medical population apparently has not responded to the call as it was believed it would. Here is a large source of supply, 72,000 under 45 years of age, more than enough to furnish the government with the medical officers it must have and yet not deplete the civilian practitioner group to the point where the civilian population will be deprived of medical aid. This is a matter to which serious thought must be given, at once, not tomorrow.

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Interstate Endorsement of Licensure

It is timely to call attention to a resolution adopted unanimously by the Advisory Council on Medical Education on February 10, 1940 and which was also adopted at the Executive Session of the Association of American Medical Colleges at the Annual Meeting held in Ann Arbor, Mich., October 29, 1940.

This resolution was as follows:

"Believing that the public interest as well as that of the medical profession and of medical education would be served by a satisfactory method of interstate endorsement of licensure, the Advisory Council on Medical Education recommends to the Federation of State Medical Boards that all state licensing boards endorse without further examination the licensure of an applicant previously obtained by examination in another state whose standards of education and examination are not lower than their own, provided that the applicant is a graduate of a medical school in the United States and its possessions which at the time of his graduation was on the list of approved medical schools."

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Dr. John C. Oliver

Dr. John C. Oliver, professor emeritus of surgery, University of Cincinnati College of Medicine, was honored on his eightieth birthday when the Elizabeth Gamble Deaconess Home Association and Christ Hospital dedicated their fifty-second annual report to him as a tribute to his long service to the hospital and to the city. Dr. Oliver, who graduated at Miami Medical College in 1885, now known as the University of Cincinnati College of Medicine, is the only surviving member of the orginal group of eighteen staff members formed in 1889 for the Christ Hospital. He still serves as consultant in surgery. Dr. Oliver was dean and professor of surgery of the Miami Medical College.

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Federal Aid for Medical Students Pursuing Accelerated Courses

The Congress has complete action on the proposal to provide federal financial aid to students pursuing accelerated courses in certain technical and professional fields considered essential in the national defense. The sum of $5,000,000 has been made available for this purpose. Assistance will be given to students, in such numbers as the chairman of the War Manpower Commission shall determine, to participate in acceler-

ated programs in degree-granting colleges and universities in engineering, physics, chemistry, medicine (including veterinary), dentistry and pharmacy whose technical or professional education can be completed within two years. Loans will be made to students who attain and continue to maintain satisfactory standards of scholarship, who are in need of assistance, who agree in writing to participate, until otherwise directed, in the accelerated programs of study and who agree in writing to engage for the duration of the wars in which the United States is now engaged in such employment or service as may be assigned by officers or agencies designated by the chairman of the War Manpower Commission. Such loans are to be made by colleges or universities or public or college connected agencies from funds paid to them out of the federal appropriation. Loans will be made in amounts not exceeding tuition and fees plus $25 a month and not exceeding a total of $500 to any one student during any twelve month period. Indebtedness of students who, before completing their courses, are ordered into military service during the present wars under the Selective Training and Service Act of 1940, or who suffer total and permanent disability or death, will be canceled. The loan program will be administered in accordance with regulations promulgated by the Commissoner of Education with the approval of the chairman of the War Manpower Commission.

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Deferment of Premedical and Medical Students

The *Journal of the American Medical Association,* August 15, 1942, published information on the deferment of premedical and medical students which answers many questions which have been asked by many persons. Major General James C. Magee, Surgeon General U. S. Army, speaking for the Army says:

"Premedical students in universities and colleges with acceptable standards may be enlisted in the Enlisted Reserve Corps under the "Pre-induction Training Plan," by passing a qualifying examination. The details of this plan are obtainable from the Dean of the educational institution or from the Commanding General of the Corps Area in which the student is pursuing his course of instruction.

On graduation from the premedical course those who have been enlisted in the Enlisted Reserve Corps may, upon application, be discharged from their enlistment and commissioned as Second Lieutenant, Medical Administrative Corps, Army of the United States, when they have been matriculated in an accredited school of medicine and can produce the certificate of the dean of the school to that effect. This commission may be held in force throughout the period of medical education so long as it is successfully and continuously pursued. In the last year of instruction in the course of medicine, application may be made for a commission as First Lieutenant in the Medical Corps, Army of the United States, and upon certification of the dean, three months prior to the date of graduation, to the effect that the student is expected to graduate he may be granted the commission for which he applies. Following this change in status, the student may be permitted to pursue an internship of twelve months' duration which must commence immediately after graduation.

Those who have been afforded the protection of this preinduction training plan should not anticipate continued deferment if they fail to enter upon an accredited internship very shortly after graduation. It is not to be expected that exemption will be continued in the case of those who unduly delay commencement of an internship, and are, therefore, not engaged in occupational or educational pursuit for which this entire plan was conceived."

Rear Admiral Ross T. McIntire, Surgeon General U. S. Navy Medical Corps, speaking for the Navy says:

"The Navy is enlisting first and second year premedical and predental

students in Class V-1 of the U. S. Naval Reserve. These men are eligible for transfer to Class V-7 on completion of their second year and, on acceptance for admission to an accredited medical or dental school, are eligible for appointment to Class H-V (P) U. S. Naval Reserve. Should he fail to qualify in medicine, he still retains his Reserve status as an enlisted man in the Navy and is eligible to serve at once in that organization. In this way the boy has had an opportunity to continue his college work, and the service has a potential candidate at all times."

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Applications for Admission to the 1942 Freshman Class

Forty-five colleges have sent in their application cards. They total 22,026 applications as against 19,731 for the 1941 class, an increase of almost 2,300 applications. The colleges whose cards have not yet been received reported 14,936 applications for the 1941 class. If these colleges had a proportionate increase in the number of applications as the colleges thus far reporting had, the total number of applications for the 1942 freshman class will be 38,645—about 4,000 more applications than were reported for all the colleges in 1941. The number of applicants cannot be given until all the cards have been received and alphabetized. It is important that this information be on hand as soon as possible as it is needed to reply to inquiries made almost daily from the authorities in Washington.

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Dr. Ray Lyman Wilbur

Dr. Ray Lyman Wilbur, president of Stanford University since 1916, will continue to head the university through the academic year ending August 1943, because of the war emergency. According to an announcement from the school, this is the third time since he reached the retirement age in 1940 that he has consented to continue to direct the university. Recently, to honor him for his long service to the university, the title of chancellor was conferred on him. During a dinner to commemorate this event, given by the alumni of Stanford University School of Medicine, San Francisco, a life size portrait of Dr. Wilbur was unveiled, the work of Josef Sigall.

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Student Loans

According to Amendment No. 8 to Regulation "W" issued by the Board of Governors of the Federal Reserve System, students may borrow money from their banks for "educational expenses" without being required to make installment payments at stated intervals. This laws is effective August 12, 1942.

This information may be helpful to your bursars in dealing with students who are unable to obtain loan aid from the regular college loan funds or from the U. S. Office of Education loan fund for advanced students in the accelerated program.

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Hugh A. McGuigan

September 1st, Dr. Hugh A. McGuigan retired from active service as professor and head of the department of pharmacology and therapeutics, at the University of Illinois, a position he has held since 1917. From 1910 to 1917 he was professor of pharmacology in Northwestern University Medical School. He is the author of "Applied Pharmacology" and has written myriads of poems many of which have been published in the Journal of the Association of American Medical Colleges. He is also an authority on Irish folklore and claims that he has seen the leprechauns and the ring around the hawthorne tree and heard the banshees wail in his home town of Lisnoe, Ireland. He would like to get into the army but since he is not eligible as far as years are concerned, he says "there will be plenty of work for fellows like me on the front home front and I mean to be on the front line wherever there is anything I can do to help my country."

College News

Medical College of the State of South Carolina

Dr. Cyril O'Driscoll has been made associate professor of anatomy. Drs. G. L. Rasmussen and George Clark have been promoted to assistant professorships.

Dr. Melvin Schadewald of the Department of Anatomy of West Virginia University has been made an instructor in the Department of Anatomy.

Dr. W. Atmar Smith, associate professor of medicine, has been made president-elect of the South Carolina Medical Association.

Dr. F. B. Johnson of the Department of Clinical Pathology returned to Charleston in June to give a short course in laboratory examinations for venereal diseases for the technicians and health officers of the State Board of Health connected with the County Venereal Clinics being established over the State.

Dr. John H. Murdoch, Jr., assistant in the Department, left for active duty with the army. Dr. O. B. Chamberlain, associate professor of medicine, has been called to active duty in the army with the rank of Major. Mr. J. A. Richardson has been added to the personnel of the Physiology Department. Dr. A. M. Lassek and Dr. Cyril O'Driscoll have instructed a class of 50 in first aid.

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Cornell University Medical College

Dr. Joseph C. Hinsey, professor and head of the Department of Anatomy, has been appointed Dean to succeed Dr. William S. Ladd, dean of the College since 1931, who retired recently because of ill health. Dr. Ladd was head of the institution during the years of organization and planning that followed the Medical College's incorporation into the new medical center which it shares with the New York Hospital. He will remain as Professor of Clinical Medicine.

The First Annual Medical College Alumni Fund amounts to 300 contributions totaling $2,394.50. This represents 60 per cent of the goal set by the Board of Directors when the fund was launched on Alumni Day, April 16th.

The Ninth General Hospital, a 1,000 bed military hospital was called for active duty July 15th. Fifity-five doctors and 120 nurses constitute its professional personnel. Dr. Ralph I. Bowers, associate professor of clinical surgery is surgical chief; Dr. Bruce Webster, assistant professor of clinical medicine heads the medical service.

Promotions and appointments:

Associate professors of clinical surgery: Nelson W. Cornell, (Orthopedics); Guilford S. Dudley and Arthur Palmer, (Otolaryngology). Ade T. Milhorat has been appointed associate professor of medicine, and Philip M. Stimson and May G. Wilson, associate professors of clinical pediatrics. Assistant professors are: Edwin T. Hauser and Henry S. Dunning, clinical medicine; John H. Eckel, clinical surgery; G. Burroughs Mider, pathology, and Charles O. Warren, anatomy. John M. McLean, associate professor of clinical surgery (Ophthalmology).

Walter L. Niles Fellowships:

Cash and contingent funds now amount to about $76,000. The money will be used to endow an annual fellowship in medicine.

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New York Medical College

The establishment of two grants is announced, one of $10,000 and the other of $4,000, by the W. K. Kellogg Foundation to be used for scholarships and loan funds for medical students and students of the School of Nursing. The John and Mary Markle Foundation has established a grant of $3,400 for further study in the use of fluoresin by members of the Faculty.

New Appointments: Dr. Milton J. Wilson, assistant to the Dean; Miss Helen Louise Baker, student personnel director; Dr. Laura F. Florence, professor and director, Department of Bacteriology; Dr. Lindsley F. Cocheu, professor and director, Department of Public Health and Industrial Medicine; Dr. Francis D. Speer, associate professor of pathology, Director of Clinical Pathology Laboratory; Dr. Earl W. Count, associate professor of anatomy; Dr. Remick C. Eckardt, associate professor of otolaryngology; Dr. Margaret C. Reynolds, associate professor of pediatrics; Dr. L. Corsan Reid, associate professor of physiology and biochemistry; Dr. Malcolm L. Carr, assistant professor of oral surgery, acting head of Section of Oral Surgery.

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Northwestern University Medical School

A grant of $3,800 has been received from the National Foundation of Infantile Paralysis to provide training in physical therapy for additional students.

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Louisiana State University School of Medicine

The Louisiana State University Unit, Military General Hospital Number 64, was mobilized by the Army of the United States for active war duty on July 15, 1942. The Unit is composed of 55 physicians and dentists, 105 nurses, and a large number of civilian specialists. It is organized to care for 1,000 patients in a base hospital and will be assigned to foreign duty. The Unit will undergo a period of training in military hospital routine at one of the Army posts in the United States before being assigned to active service with a combat force.

The medical and nursing staff will be supplemented by the addition of some 500 enlisted personnel. All medical members of the Unit hold positions on the faculty of the Louisiana State University School of Medicine.

Many members of the group were already on active duty and many others had applied for immediate active duty and were awaiting assignment when the call for mobilization of the Unit was received. These members joined the Unit at the port of mobilization.

The Unit was organized during the summer of 1940 by Dr. Urban Maes, Director of the Department of Surgery of the School of Medicine in charge of the surgical section of Base Hospital No. 24 during World War I and who served in France.

From the time its organization was completed until its mobilization, the Unit was directed by Lieutenant-Colonel Ben R. Heninger, Clinical Professor of Medicine. On mobilization of the Unit, Colonel Daniel B. Faust of the regular Army Medical Corps was assigned to command the Unit. Lieutenant-Colonel Heninger is chief of the medical section of the Unit, and Lieutenant-Colonel Charles J. Miangolarra, clinical assistant professor of surgery, is the chief of the surgical section of the Unit.

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University of Rochester School of Medicine

Dr. Herman E. Pearse has been promoted from assistant to associate professor of surgery; Dr. John A. Benjamin, appointed assistant professor of urological surgery; Dr. Louis A. Goldstein, promoted from instructor to assistant professor of orthopedic surgery; Dr. Hrolfe R. Ziegler, from instructor to assistant professor of surgery and anatomy; Dr. Robt. W. Ramsey, from instructor to associate in physiology; Dr. Geo. H. Ramsey and Dr. Andrew Dowdy, from assistant professor to associate professor of radiology; Dr. Chas. E. Tobin, from instructor to assistant professor of anatomy.

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University of Virginia Department of Medicine

Under the will of the late Mr. William James Rucker, Charlottesville, $25,000 was left to the medical school for research in etiology and treatment of arthritis. One third of the residual es-

tate, estimated at more than $1,000,000, will go to the University Hospital. The other two thirds is to be divided between the Martha Jefferson Hospital and Sanitarium, Charlottesville, and St. Luke's Hospital, St. Louis. Under the will of Dr. William E. Hopkins, Los Angeles, the medical school has received $13,432 for the purchase of medical books and journals for the medical school library. On the death of Dr. Hopkins' widow, the residuary estate of about $125,000 will go to the medical school. Dr. Stephen H. Watts, professor of surgery at the school from 1907 to 1928, has established an endowment fund for the purchase of books and periodicals for the library. The McIntyre Tumor Clinic at the university will receive the residue of the $11,000 estate of the late Nancy Vance for the treatment and terminal care of persons with incurable cancer. The John and Mary R. Markle Foundation has given $2,000 to support further investigations on heparin in relation to peritoneal adhesions and other tissue reactions under the direction of Drs. Edwin P. Lehman and Floyd E. Boys, and the National Research Council has granted $2,000 to the department of physiology for work in endocrinology under the direction of Dr. Sydney W. Britton. The department of syphilology and dermatology has been given $3,600 by E. R. Squibb and Sons for the study of a new arsenical in the treatment of syphilis over a three year period.

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West Virginia University School of Medicine

The University opened its new student health center May 15. The $150,000 building is three stories high. The first floor has a large waiting room, offices for four physicians and treatment rooms. The second floor houses the department of pathology and clinical microscopy, while the third floor has accommodations for 21 bed patients and is fully equipped for hospitalization. One ward may be used for an isolation ward. The staff consists of three full time physicians, three full time trained nurses and one full time laboratory technician. The center is under the direction of the university's school of medicine.

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University of Chicago School of Medicine

Dr. Fred L. Adair, chairman of the department and Mary Campau Ryerson professor of obstetrics and gynecology and chief of service at the Chicago Lying-In Hospital, will retire on October 1, having reached the age of retirement. He will be succeeded by Dr. William J. Dieckmann, associate professor in the department.

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Jefferson Medical College

The Graduating Class of 1942 presented a portrait of Dr. H. E. Radasch to the college on March 26, 1942.

The 38th General Hospital Unit of the Jefferson Hospital left for Camp Bowie, Texas, on May 15, 1942. Approximately sixty-two doctors and one hundred nurses composed this unit. Dr. Baldwin L. Keyes, Lt. Col., M.C., U. S. A., is the Unit Director.

On May 27, 1942, the Degree of Doctor of Science was conferred upon Dr. Randle C. Rosenberger, Professor of Preventive Medicine and Bacteriology at The Jefferson Medical College, by the Philadelphia College of Pharmacy and Science.

The following additions and promotions in the teaching corps have been made, during the past session: Dr. William Harvey Perkins, Dean and professor of preventive medicine; Dr. Hobart A. Reimann appointed acting head of the Department of Experimental Medicine; Dr. Baldwin L. Keyes, professor of psychiatry; Dr. Harold W. Jones, professor of clinical medicine and hematology and appointed to the Thomas Drake Martinez Cardeza Chair of Clinical Medicine and Hematology; Dr. Martin E. Rehfuss, Sutherland M. Prevost Lecturer in Therapeutics in the Department of Medicine; Dr. Clifford B. Lull, clinical professor of obstetrics; Dr. Garfield G. Duncan, clin-

ical professor of medicine; Dr. William J. Harrison, associate professor of ophthalmology; Dr. David R. Morgan, associate professor of pathology; Dr. Robert A. Matthews, associate professor of psychiatry; Dr. William H. Schmidt, associate professor of physical therapy; Dr. Charles Lintgen, assistant professor of gynecology; Dr. Mario A. Castallo, assistant professor of obstetrics; Dr. Arthur First, assistant professor of obstetrics; Dr. Robert A. Groff, assistant professor of neurosurgery; Dr. Reynold S. Griffith, assistant professor of medicine.

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Stanford University School of Medicine

Dr. Alfred C. Reed has been appointed associate clinical professor of medicine. He resigned as professor of tropical medicine in the University of California.

The School of Health received a grant of $6,920 from the National Foundation of Infantile Paralysis to provide training in physical therapy for additional students.

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University of Oklahoma School of Medicine.

Dr. Bela Halpert, of the Louisiana State University School of Medicine, has been appointed Director of Laboratories of the University and Crippled Children's Hospitals, and professor of clinical pathology.

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Temple University School of Medicine

Dr. Philip D. Woodbridge of the Lahey Clinic, Boston, has been appointed professor of anesthesiology.

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University of Nebraska College of Medicine

Dr. James P. Tollman, associate professor of clinical pathology, has been appointed assistant dean, effective July 1.

Hahnemann Medical College

Dr. William L. Martin was named professor and head of the department of surgery to succeed Dr. Gustave A. Van Lennep, who becomes professor emeritus of surgery. Dr. Newlin Fell Paxon was appointed professor and head of the department of obstetrics, succeeding Dr. Warren C. Mercer, who becomes professor emeritus of obstetrics. Dr. Henry S. Ruth was made professor and head of the department of anesthesia, succeeding Dr. James M. Godfrey, who also becomes professor emeritus. Dr. William M. Sylvis, formerly professor of anatomy, was appointed professor of surgery at the school.

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University of Oregon Medical School

Dr. David W. E. Baird, Jr., associate dean and associate clinical professor of medicine, has been appointed acting dean of the school during the absence of Dr. Richard B. Dillehunt, who has been in poor health. During the coming year Dr. Dillehunt will study and rest, having recently been granted a sabbatical leave by the state board of higher education. Dr. Dillehunt is also clinical professor and head of the division of orthopedic surgery at the school.

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Johns Hopkins University School of Medicine

The National Foundation for Infantile Paralysis has given a $300,000 grant to Johns Hopkins University, Baltimore, for a long time study of the disease. This is the largest single grant made by the foundation since it was organized in 1938. The money will be used to establish and conduct a Center for the Study of Infantile Paralysis and Related Viruses at the medical school and will be allocated over a five year period. Work at the center will be under the direction of Dr. Kenneth F. Maxcy, professor of epidemiology in the school of hygiene and public health. Three members of the staff who will be named to assist Dr. Maxcy include Dr. How-

ard A. Howe and Dr. David Bodian, formerly of the department of anatomy in the medical school, and Robert C. Mellors, Ph.D., a biochemist from Western Reserve University School of Medicine, Cleveland. These persons have already started work. In setting up the center, adequate laboratory space and facilities have been provided and resources of the new grant will permit the investigators to carry on their studies in the field as well as in the laboratory as opportunity may be presented. The ultimate objective is to gain a more complete understanding of the spread of the poliomyelitis virus not only within the human body but in the community, from one individual to another.

Dr. John A. C. Colston, since 1934 associate professor of urology, has been announced as the successor of Dr. Hugh H. Young as professor of urology at Johns Hopkins and as director of the Brady Urological Institute of Johns Hopkins Hospital. Dr. Young retired on June 30 with the title professor emeritus of urology.

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University of Pennsylvania School of Medicine

Dr. Milton Rose, professor of public health administration, has been appointed director of medical and health service for the Pacific area of the American Red Cross, with headquarters in San Francisco.

Dr. Paul C. Colonna, director of orthopedics of the State University and Crippled Children's Hospital, and professor of orthopedic surgery of the University of Oklahoma School of Medicine, Oklahoma City, has been appointed professor of orthopedic surgery at the University of Pennsylvania School of Medicine. Other changes on the faculty include the appointment of Harry E. Morton, Sc.D., to associate professor of bacteriology, Dr. Dale R. Coman to assistant professor of pathology, Richard G. Abell, Ph.D., to assistant professor of anatomy, Dr. Oscar V. Batson to professor of anatomy in the Graduate School of Medicine and assistant professor of otolaryngology in the school of medicine, and Dr. Harriett Elizabeth Glenn Ravdin to assistant to the dean, school of medicine.

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Tufts College Medical School

Dr. Elmer W. Barron, professor of pediatrics since 1929, has been made professor emeritus.

Promotions: Dr. James M. Baty, professor of pediatrics; Dr. Francis C. McDonald, clinical professor of pediatrics; Dr. Richard Wagner, assistant professor of pediatrics; Dr. Bernard Appel, assistant professor of dermatology; Dr. Francis P. McCarthy, lecturer in dermatology; Harry H. Powers, Ph.D., associate professor of biochemistry.

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Washington University School of Medicine

Dr. William Barry Wood Jr., Baltimore, has been appointed Busch Professor of Medicine to succeed Dr. David P. Barr who resigned last year to accept a similar position at Cornell University Medical College, New York.

A series of changes in the laboratories formerly maintained by the school of medicine is announced. Dr. Paul O. Hageman has been appointed director in charge of serology and bacteriology, Dr. Harold A. Bulger of blood chemistry and basal metabolism, Dr. Carl V. Moore of clinical microscopy and Drs. Nathan A. Womack and John E. Hobbs in charge of combined surgical and gynecologic pathology. All are members of the faculty of the school of medicine. Last year Barnes Hospital assumed the responsibility for the maintenance and direction of the laboratories.

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Dartmouth Medical School

The annual W. J. and C. H. Mayo Memorial Lectureship in the field of medicine and surgery has been established at Dartmouth College, by Dr. and Mrs. Waltman Walters, Rochester,

Minn. Dr. Walters, a Dartmouth graduate of 1917, gave the administration of the lectureship to the Dartmouth Medical School. The memorial was established there as "a stimulating factor in interesting men in medicine and surgery; particularly to call attention to the accomplishments of Drs. W. J. and C. H. Mayo in these fields."

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Indiana University School of Medicine

Mrs. William M. Louden, Indianapolis, recently established the Lila B. Louden Scholarship Loan Fund with a contribution of $1,000 to aid students in the School of Medicine to complete their training. The contribution supplements a previous gift for the same purpose and serves as a memorial to her two sons.

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University of Mississippi School of Medicine

Dr. R. P. Walton, professor of pharmacology has resigned to accept a position in the Medical College of the State of South Carolina. Dr. James C. Rice of Louisiana State University School of Medicine is his successor.

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University of Texas School of Medicine

Dr. John W. Spies was dismissed from the deanship by the Board of Regents of the University August 1st. Dr. Titus Harris, professor of neuropsychiatry, was appointed acting dean. It is planned to appoint a vice president who will have full control of the medical school and responsibile directly to the Board of Regents instead of to the president of the university. All heads of departments have been required to resign as such but will continue as members of their departments.

Dr. Chauncey D. Leake, professor and head of the department of pharmacology in the University of California Medical School has been appointed executive vice president and dean. Dr. Leake will also have administrative jurisdiction over the John Sealy Hospital and the College of Nursing. He will be directly responsible to the Board of Regents of the University, not to the president according to reports received from the press.

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Harvard Medical School

Dr. George Van S. Smith, Brookline, assistant professor of gynecology, has been promoted to W. H. Baker professor of gynecology, effective July 1. Other promotions include:

Dr. Francis R. Dieuaide, clinical professor of medicine; Edward W. Dempsey, Ph.D., assistant professor of anatomy; Dr. Robert N. Nye, assistant professor of bacteriology and immunology; Dr. Austin M. Brues, assistant professor of medicine; Dr. Robert E. Gross, assistant professor of surgery; Frank W. Maurer, Ph.D., and Madeleine F. Warren, Ph.D., assistant professor of physiology; Dr. Joe V. Meigs, clinical professor of gynecology.

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Emory University School of Medicine

The 43rd General Hospital, Emory Unit, of the U. S. Army has been organized. The chief of the surgical service is Dr. Ira Ferguson and the chief of the medical service is Dr. Hugh Wood, both holding the rank of Lieutenant-Colonel. The commanding officer will be a member of the Army Medical Corps. It is believed that the unit will be activated by September 1. The doctors, dentists and nurses will be representative of Atlanta. Destination is not known. This unit is the successor of Base Hospital No. 43 of the first World War. Forty-four physicians and 7 dentists comprise the professional personnel of the unit.

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University of Maryland School of Medicine

Mr. Charles McManus of Baltimore has awarded a grant of $7,500 to Dr. John C. Krantz, Jr., professor of phar-

macology. The money is the third of a series of grants awarded by Mr. McManus for the purpose of studying the pharmacology of arthritis and the use of various drugs in the treatment of this disease.

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Marquette University
School of Medicine

A grant of $1,500 has been received from The National Foundation for Infantile Paralysis to study the relationship of nutrition to the morphology and physiology of the neuromuscular apparatus in skeletal muscles.

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Tulane University of Louisiana
School of Medicine

The junior and senior classes will begin work September 14th instead of September 1st as previously announced. Registration will begin September 7th. Freshmen and sophomores will begin work September 1st.

Three members of the faculty left on July 4 for a tour of hospitals and medical schools in Venezuela. The three physicians are Drs. Hiram W. Kostmayer, acting dean of the medical school; E. W. Alton Ochsner, William Henderson professor of surgery, and William A. Sodeman, assistant professor of medicine. They will make a study under the direction of Dr. Alfred Gage, associate director of the medical department of the Standard Oil Company. One object of the trip will be to complete plans for the oil company to send two Venezuelan students to Tulane each year for medical and premedical work.

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Dalhousie University
Faculty of Medicine

Dr. H. Bruce Collier has been appointed assistant professor of biochemistry. He was formerly biochemist at the Institute of Parasitology, McGill University. He takes the place of Dr. R. D. H. Heard who has become assistant professor of biochemistry at McGill University.

Dr. Karl M. Wilbur is taking the place of Dr. Hugh Davson as assistant professor in the department of physiology. Dr. Davson is on leave of absence in England for the duration of the war. Dr. Wilbur was formerly instructor in the department of zoology at Ohio State University.

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Baylor University
College of Medicine

The Clarence M. Grigsby Memorial Fund will be established under a bequest mentioned in the will of the late Dr. Grigsby. The fund will be derived from the sale of his home and furniture, the proceeds to go to the Southwestern Medical Foundation to establish a fund which will be used for the purchase of medical literature at the medical school.

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University of Georgia
School of Medicine

The State of Georgia has added to the medical school budget, annually, $50,000 for hospitalization of patients from outside of Richmond County and particularly from rural counties. Between 40 and 50 beds will be occupied by these patients. This is the opening wedge for a general state hospital in Augusta.

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Western Reserve University
School of Medicine

Walter E. Hanbourger, Ph.D., assistant professor of pharmacology has been appointed pharmacologist for G. D. Searle & Company, Skokie, Ill.

General News

Grants for Research in Nutrition

Grants totaling $125,000 have been awarded by the Nutrition Foundation, Inc., New York, to finance a broad program for fundamental research in the science of nutrition. Thirty-six grants ranging from $250 to $7,000 each went to twenty-five universities and research groups in various parts of the United States and Canada. Five universities received multiple grants: Columbia, Yale and the Universities of Illinois, Wisconsin and Minnesota. Institutional grants went to the Children's Fund of Michigan, Detroit, the Food and Nutrition Board of the National Research Council and the New York Agricultural Station, Geneva, N. Y. The projects to be financed were chosen from eighty-one applications by the foundation's scientific advisory committee, of which Charles Glen King, Ph.D., is director. Among the studies to be considered are nutrition in relation to fatigue, effects of environment on nutritional requirements and a natural butter of high nutritional value and high melting point suitable for use in the tropics.

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Genetics

The first lecture under the auspices of the newly organized Charles Fremont Dight Institute for the Promotion of Human Genetics, now in operation on the University of Minnesota campus, Minneapolis, was delivered recently by Dr. Philip Levine, Newark, N. J., on "Serological Differentiations of Human Blood."

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Dallas Medical Center

An agreement between the Southwestern Medical Foundation and Baylor University to set up a medical center in Dallas was approved at a special meeting of the executive board of the Baptist General Convention. Under a ninety-nine year contract the medical and dental schools of the university will be moved, as soon as buildings are provided, to a 35 acre tract along Hines Boulevard and including Parkland Hospital. Under the contract one million dollars will be expended by the foundation for buildings for medical teaching, construction to start within a period of not less than two years after removal of priority restrictions. Parkland Hospital will be enlarged and become an integral part of the center, its facilities to be used in connection with the medical and dental colleges. The site for the center is within a few blocks of a large group of hospitals. Development of the medical center will be in cooperation with the city-county hospital board administering Parkland Hospital, where the first aim of the medical foundation will be to improve clinical facilities. A dispensary will be the first unit in the new construction program. In addition to providing the buildings, the foundation will also furnish money for teaching. The medical school will continue to receive income from endowment, but Baylor University will retain the endowment fund. All student fees will go into the fund for teaching.

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Theobald Smith Award

The American Association for the Advancement of Science has announced that nominations for the Theobald Smith Award, consisting of $1,000 and a bronze medal provided by the Eli Lilly Company of Indianapolis, are now being accepted. The nominees for the award must have been not over 35 years of age on January 1 in the year in which the award is made. The purpose of the award is to recognize demonstrated research in the field of medical science, taking into consideration independence of thought and originality. Nominations and supporting material should be sent

to Malcolm H. Soule, LL.D., secretary of the section on medical sciences (N), Hygienic Laboratory, University of Michigan, Ann Arbor, Mich. Dr. Soule is also secretary of the award committee.

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Illinois State Board Ruling on Graduates of Foreign Schools

Graduates of medical colleges in continental Europe and graduates of the extramural colleges of Scotland and Ireland who finished after July 1, 1936 (Switzerland excepted) will not be admitted to Illinois medical examinations, according to an announcement from the state department of registration and education. This rule will be in force until a true evaluation of the colleges referred to may be obtained, at which time such nonaccredited foreign colleges will be required to prove to the department that their courses and equipment are in every way equal to American medical colleges accredited by the department of registration and education. Other schools in foreign nations may be recognized under the same terms and conditions as obtained before the rule adopted on Feb. 21, 1941. This rule shall supersede all rules heretofore adopted and in conflict therewith but will not be retroactive in the sense that it will affect European graduates who have been issued licenses after examination by the department, even though they graduated after 1936.

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American College of Physicians

The American College of Physicians has announced its 27th Annual Session to be held in Philadelphia, April 13 to 16, inclusive, 1943. Heretofore, the College has held a five-day Session, but in the interest of conserving time and expense of its members, the program will be condensed into four days. Dr. James E. Paullin, Atlanta, president of the College, will have charge of the program of general sessions and lectures. Dr. George Morris Piersol, Philadelphia, General Chairman, will be responsible for the program of hospital clinics, panel discussions, local arrangements, entertainment, etc. The general management of the session and technical exhibits will be handled by the executive secretary, Mr. E. R. Loveland, 4200 Pine St., Philadelphia.

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Studies on Infantile Paralysis

Announcement of a five year, $300,000 grant to the Johns Hopkins University, Baltimore, for an intensive and long time study of infantile paralysis was made in July by Basil O'Connor, president of the National Foundation for Infantile Paralysis. This is the largest single grant made by the National Foundation since it was organized in 1938. It will be used to establish and conduct the Center for the Study of Infantile Paralysis and Related Viruses at Johns Hopkins. The funds which make this and other research projects of the National Foundation possible are contributed each year at the time of the national celebration of the President's birthday.

In announcing the grant, Mr. O'Connor said: "The establishment of this Center at Johns Hopkins is the product of the ideas of many investigators who, after years of research experience in the field of infantile paralysis, keenly felt the need for a Center in which the talents of numerous scientists with widely diverse backgrounds could be pooled in a concentrated attack upon the problems of the disease. In addition to the separate research work of individuals now supported by the National Foundation in leading institutions throughout the country, there has been a need for units in which all the problems of poliomyelitis could be studied on a comprehensive scale and on a long time basis. The Johns Hopkins University offers an ideal place for such a Center, as a large number of the required staff of epidemiologists, virologists, serologists, neurologists and chemists acquainted with the problems presented by poliomyelitis are available there.

"In view of war conditions it is highly desirable, if it can be accomplished without sacrificing defense interests, to

keep a nucleus of scientists at work on the problems of infantile paralysis which are so important to human welfare, with the hope that, when peace is established, contemplated expansion in this field may be rapidly consummated."

Work at the Center will be under the direction of Dr. Kenneth F. Maxcy, professor of epidemiology in the School of Hygiene and Public Health. Dr. Maxcy will be assisted by a competent group of scientists, some of whom already have made significant contributions to research in this field.

Three members of this staff have been appointed and have begun their work, according to Dr. Maxcy. They are Dr. Howard A. Howe and Dr. David Bodian, formerly of the Department of Anatomy in the Johns Hopkins University School of Medicine, and Dr. Robert C. Mellors, a biochemist from Western Reserve University.

These two investigators have conducted a large number of experimental studies on poliomyelitis as members of the staff of the Department of Anatomy. Their studies recently were collected in book form under the title, "Neural Mechanisms in Poliomyelitis." The investigations reflected in this publication deal mainly with the manner in which the causative virus gains entrance to the body, travels along nerve pathways in the brain and spinal cord, destroying certain kinds of nerve cells while leaving others unscathed. This kind of knowledge is fundamental to an understanding of how to prevent the paralysis that follows so frequently. The newly announced grant from the National Foundation for Infantile Paralysis will permit considerable expansion of work in this field. Other appointments will be made to augment the staff of three already at work.

In setting up the Center, adequate laboratory space and facilities have been provided and resources of the new grant will permit the investigators to carry on their studies in the field as well as in the laboratory as opportunity may be presented. The ultimate objective is to gain a more complete understanding of the spread of the poliomyelitis virus not only within the human body, but in the community, from one individual to another. The mechanism by which it maintains itself in human populations is not yet known. Much additional knowledge is necessary before it will be possible to devise effective measures for the suppression of the disease.

Checks totaling $325,844.25 have been forwarded by the National Foundation for Infantile Paralysis, Inc., to 26 institutions in various parts of the United States and Canada to carry on virus and after-effects research work and education in the fight against infantile paralysis.

The grantees and the amount of each grant follow:

For After-Effects Research:

The State University of Iowa, College of Medicine, Iowa City, Iowa, $11,200.

University of Rochester, School of Medicine and Dentistry, Rochester, New York, $9,200.

University of California, Medical School, San Francisco, California, $5,050.

The Children's Hospital, Boston, Massachusetts, $4,250.

Massachusetts General Hospital, Boston, Massachusetts, $4,200.

Michael Reese Hospital, Chicago, Illinois, $3,000.

University of Toronto, School of Hygiene, Toronto, Canada, $1,000.

N. Y. Society for the Relief of the Ruptured and Crippled, New York, New York, $1,000.

University of Southern California, School of Medicine, Department of Anatomy, Los Angeles, California, $890.

For Virus Research:

The Johns Hopkins University, Baltimore, Maryland, $59,244.

University of Michigan, School of Public Health, Ann Arbor, Michigan, $40,000.

University of Minnesota, The Medical School, Minneapolis, Minnesota, $13,255.25.

Michigan Department of Health, Lansing, Michigan, $13,210.

University of Wisconsin, Madison, Wisconsin, $12,200.

Connaught Laboratories, University of Toronto, Toronto, Canada, $10,860.

University of Michigan, Ann Arbor, Michigan, $7,000.

University of Chicago, Chicago, Illinois, $6,090.

Wayne University, College of Medicine, Detroit, Michigan, $4,700.

National Institute of Health, Bethesda, Maryland, $3,500.

University of Pennsylvania, Philadelphia, Pennsylvania, $2,500.

Harvard Medical School and Surgical Research Laboratory, Boston City Hospital, Boston, Mass., $1,500.

For Education:

Georgia Warm Springs Foundation, Warm Springs, Georgia, $50,120.

National Organization for Public Health Nursing, New York, New York, $31,100.

National League of Nursing Education, New York, New York, $16,000.

Harvard Infantile Paralysis Commission, Boston, Massachusetts, $5,000.

Frances Payne Bolton School of Nursing, Western Reserve University, Cleveland, Ohio, $9,775.

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Fellowships in Medicine and Public Health

The Commonwealth Fund of New York announces that it is offering through the Pan American Sanitary Bureau fifteen fellowships for one year's study of public health subjects or post-graduate medical courses to properly qualified persons who are citizens of the other American republics. Fellowships in public health will be open to physicians, sanitary officers, technicians, public health nurses, etc. These fellows will be selected through a system of cooperation with medical and health authorities of the different countries concerned, and whenever deemed advisable they will be interviewed by traveling representatives of the Pan American Sanitary Bureau. Each fellowship will provide living allowances while the holder is in the United States, travel costs, and tuition. Knowledge of the English language will be among the requirements, and also the possession of certain specific qualifications.

Application blanks giving complete information will be available through the Commonwealth Fund, 41 East 57th Street, New York; the Pan American Sanitary Bureau, Washington, D. C.; or chiefs of American Missions in Latin America.

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The Society of the New York Hospital Lewis Cass Ledyard, Jr. Fellowship

The Lewis Cass Ledyard, Jr., Fellowship was established in 1939 by a gift from Mrs. Ruth E. Ledyard, in memory of her late husband, Lewis Cass Ledyard, Jr., a Governor of The New York Hospital. The income, amounting to approximately $4,000.00 annually, will be awarded to an investigator in the fields of medicine and surgery, or in any closely related field. This amount will be applied as follows: $3,000.00 as a stipend and, approximately, $1,000.00 for supplies or expenses of the research. In making the award, preference will be given to younger applicants who are graduates in medicine, and who have demonstrated fitness to carry on original research of high order. The recipient of this Fellowship will be required to submit reports of his work under the Fellowship, either at stated intervals or at the end of the academic year; and when the result of his work is published he will be expected to give proper credit to the Lewis Cass Ledyard, Jr., Fellowship. The research work under this Fellowship is to be carried on at The New York Hospital and Cornell University Medical College. The fellowship will be available on July 1st at the beginning of the academic year. Applications for the year 1943-44 should be in the hands of the Committee by the 15th of December. It is expected that the award will be made by March 15, 1943.

Application for this Fellowship should be addressed to: The Committee of the Lewis Cass Ledyard, Jr. Fellowship; The Society of The New York Hospital; 525 East 68th Street, New York, N. Y.

Instruments for Research Workers

Research workers seeking instruments required in their work but difficult to find are invited to communicate with D. H. Killeffer, 60 East Forty-Second Street, New York, chairman of the newly appointed Committee on the Location of New and Rare Instruments of the National Research Council. The plan of the committee's activity is to assist in locating needed instruments of types not ordinarily available through accustomed channels.

Assistance is particularly desired from owners and builders of instruments falling within the new or rare categories which might be made available to others through sale or for temporary use under mutually satisfactory conditions.

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Fellowships in Tropical Medicine

The American Foundation for Tropical Medicine, Inc., announces the establishment of two paid fellowships at the Graduate School of Tropical Medicine of Tulane University of Louisiana, New Orleans. The fellowships have been made possible by the Winthrop Chemical Company, Inc., Winthrop Products, Inc., and the Lambert Pharmacal Company of St. Louis. These fellowships, which will be known as the Winthrop Fellowship and the Lambert Pharmacal Co. of St. Louis, Mo., fellowship, have been established to provide graduate training in tropical medicine for young physicians who are citizens of the United States. Applications should be addressed to the dean of graduate studies, Tulane University, New Orleans.

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Agreement Between Emory University and Microscope Owners

The plan worked out by Dr. John H. Venable, associate professor of anatomy, is as follows:

(1) Only new or relatively new microscopes, both monocular and binocular, will be used. (2) Owners will receive \$15.00 (monocular) or \$25.00 (binocular) per full academic year (9 months, at present). This is to be held on account until the microscope is returned, or credited to tuition as long as owner is in school. There will be no cash payments to owner of the microscope until loan is terminated. (3) Microscopes will be returned to owner in good condition at the end of loan period. In case of damage they will be repaired. (4) Microscopes will be insured against fire and theft for loan period. (5) Microscopes may be reclaimed by owner at any time necessary within 30 days after request in writing, but there will be no fee for any part of a full academic quarter. Funds credited to the owner will be paid in cash at each termination of agreement. (6) Microscope fees will be assessed against all 1st and 2nd year students, beginning with class entering March, 1943. This same class, on reaching the third year, will be required to pay a fee of \$1.00 per quarter for use of the University's microscopes in the laboratory at Grady Hospital.

Book News

Textbook of Bacteriology

By Thurman B. Rice, M.D., Professor of Bacteriology and Public Health, Indiana University School of Medicine. Ed. 3. W. B. Saunders Company, Philadelphia. 1942. Price, $5.

A practical rather than a theoretical text, intended for those who might wish to have full understanding of the subject, but who do not have or cannot find the time to go into all the fine points of theory. The text must be used with a course of lectures and laboratory exercises. Additional assignments can be made from libraries. The book will serve well as a basis for the understanding of disease. The book should go far in improving the teaching of bacteriology to undergraduate medical students. A bibliography is missing because the author believes that medical students do not pay any attention to a bibliography printed in the text but will consult source references if directed to do so by the instructor—a very good point.

Textbook of Histology

By Alexander A. Maximow, late Professor of Anatomy, University of Chicago, and William Bloom, Professor of Anatomy, University of Chicago. Ed. 4. W. B. Saunders Company, Philadelphia. 1942. Price, $7.

This book provides the student with an adequate description of the minute structure of the human body and the morphologic evidences of its functions, introducing as much of the data of physiology, pathology and experimental zoology as seems pertinent and desirable in the limits of the field of histology. An extensive revision has been made. The greatest changes are in the introduction and the chapters dealing with bone, nerve, spleen, the femal generative system and the eye. Many new figures have been added.

War Gases: Their Identification and Decontamination

By Morris B. Jacobs, Ph.D., formerly Lt. U. S. Chemical Warfare Service Reserve. Interscience Publishers, New York City. 1942. Price, $3.

For the gas identification officer, the war gas chemist, the decontamination officer and the health officer, the air raid warden and all persons dealing with gas defense. Replete with much valuable information on war gases—their composition, action and how to combat them.

Essentials of Pathology

By Lawrence W. Smith, M.D., Professor of Pathology, and Edwin S. Galt, M.D., Associate Professor of Pathology, Temple University School of Medicine; with a foreword by James Ewing, M.D. Ed. 2. D. Appleton-Century Company, New York. 1942. Price, $10.

Teaching pathology by means of case histories. The first thirteen chapters have been rewritten to include a full discussion of principles and mechanisms of general pathology and a brief bibliography has been added containing carefully selected references arranged according to structures. Worthy of special commendation are the many hundreds of beautiful illustrations, both white and black and colored. It is a pity that the book is so large and ponderous.

Blood Grouping Technic

By Fritz Schiff, M.D., Late Chief of the Department of Bacteriology, Beth Israel Hospital, New York City, and William C. Boyd, Ph.D., Associate Professor of Biochemistry, Boston University School of Medicine. Interscience Publishers, Inc., New York. 1942. Price, $5.

A manual for clinicians, serologists, anthropologists and students of legal and military medicine. Gives clear and concise directions for carrying out blood grouping tests, not only as a preliminary to transfusion, but also in connection with cases of disputed parentage and other forensic applications. The senior author's work is well known here and abroad. The junior author's work is known in this country. A good book for all those who have to do this sort of work and also for those who are not well informed on the subject.

The National Formulary

Prepared by the Committee on National Formulary by authority of the American Pharmaceutical Association. Ed. 7. Official from November 1, 1942. American Pharmaceutical Association, Washington, D. C. 1942. Price, $7.50.

The authority on drugs, their preparations, etc., for use by physicians and medical students to aid them to better and more effective prescribing. Every medical student will do well by himself if he owns a copy of this book and uses it freely.

The Parasites of Man in Temperate Climates

By Thomas W. M. Cameron, Professor of Parasitology, McGill University. The University of Toronto Press. Toronto, Canada. 1940. Price, $3.

Only parasites which occur in North America or Great Britain are discussed in detail; those which may be introduced in patients from the tropics, but which cannot become acclimatized, are dealt with briefly, while odd, aberrant or doubtful forms are omitted entirely. The book is not intended for the student but for the practitioner working in the English speaking temperate and subtropical zones.

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Treatment in General Practice

By Harry Beckman, M.D., Professor of Pharmacology, Marquette University School of Medicine. Ed. 4. W. B. Saunders Company, Philadelphia. 1942. Price, $10.

Slowly but definitely the size of this work is becoming cumbersome, due, in large part, to the need for including new clinical entities. The value of the work remains as good as always.

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Morris' Human Anatomy

Edited by J. Parsons Schaefer, M.D., Professor of Anatomy and Director of the Daniel Baugh Institute of Anatomy, Jefferson Medical College. Ed. 10. The Blakiston Company, Philadelphia. 1942. Price, $12.

Thoroughly revised; many new illustrations; expansion of the bibliography.

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The Pathology of Trauma

By Alan Richards Moritz, M.D., Professor of Legal Medicine, Harvard Medical School. Lea & Febiger, Philadelphia. 1942. Price, $6.

The volume surveys the principal causes of such injuries, the manner in which they appear to produce functional or organic disturbances, the pathological characteristics of the resulting lesions, the pathogenesis of their complications and sequelae and certain types of collateral evidence likely to be of medico-legal interest. Those subjects which appear to be inadequately discussed elsewhere are presented in detail. The assembling of this mass of information in a single volume should be of the greatest convenience to all clinicians and pathologists. This volume is sure to be of inestimable potential usefulness to physicians who contemplate entering military service, to medical examiners, industrial physicians, to lawyers who specialize in compensation work and to general practitioners.

Stedman's Practical Medical Dictionary

By Stanley Thomas Garber, M.D., University of Cincinnati College of Medicine. Ed. 15. The Williams & Wilkins Company, Baltimore. 1942. Price, $7.50.

Complete, authoritative, reliable and easy to use; clear definitions and plain instructions about pronunciation. Complete revision demanded resetting the work. In order not to increase the size, a rather small type is used which may be difficult to read for some persons. It is trying on the eye.

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Cabot and Adams Physical Diagnosis

By F. Dennette Adams, M.D., Instructor in Medicine, Harvard Medical School. Ed. 13. The Williams & Wilkins Company, Baltimore. 1942, Price, $5.

A very worth while book for the medical student who needs to be well grounded in this subject. Symptomatology and clinical entities are stressed as well as the relationship of physical signs to other subjects of disease.

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Physical Chemistry; for Students of Biochemistry and Medicine

By Edward Staunton West, Ph.D., Professor of Biochemistry, University of Oregon Medical School. The Macmillan Company New York. 1942. Price, $5.75.

This book presents the selected phases of physical chemistry recognized as basic to an understanding of biological phenomena. It is designed for students of premedicine, medicine and biology with special emphasis on the necessary mathematics so the student may understand, rather than simply remember, equations.

The book includes a comprehensive tabulation of chemical literature, and a thorough discussion of atomic structure, chemical combination and related phenomena which form the basis of modern chemistry.

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The Science of Health

By Florence L. Meredith, M.D., Professor of Hygiene, Tufts College. The Blakiston Company, Philadelphia. 1942. Price, $2.50.

For the student. The introductory chapter gives a summary of the health situation of the country today. Chapters on anatomy and physiology have been held to a minimum of space while the treatment of nutrition and current health problems is unusually complete. The section on nervous and mental disorders gives intelligible, well-balanced discussions of both organic and functional neuroses and psychoses. The chapter on Mental Health is an excellent introductory approach to the psychology of adjustment.

Central Autonomic Regulations in Health and Disease

By Heymen R. Miller, M.D., Associate Attending Physician Montefiore Hospital, New York City, with an introduction by John F. Fulton, M.D., Sterling Professor of Physiology, Yale University. Grune & Stratton, New York. 1942. Price, $5.50.

The essential anatomic, physiologic and pharmacologic facts have been systematically organized and correlated with clinical material. Special attention is given to the autonomic innervations. The book has been written from the point of view and out of the need of the clinician.

The emphasis is not on pathologic morphology, but on the influence of the autonomic mechanisms on clinical conditions.

Separate chapters deal with the functions of the autonomic centers in the brain as they bear on cardiovascular, gastrointestinal, genito-urinary, and respiratory conditions and on emotional and sleep-waking disorders. The influence of the central controls on heat regulation, water control and metabolism is also treated in detail.

The author has utilized personal clinical observations and material. Numerous illustrations and special drawings clarify the text. A comprehensive bibliography follows each chapter.

The Biological Action of the Vitamins: A Symposium

Edited by E. A. Evans, Jr., Associate Professor of Biochemistry, University of Chicago. The University of Chicago Press. 1942. Price, $3.

Fourteen authorities on vitamins present the most up-to-date information on the biological action of vitamins. These papers are part of those read in a symposium by representatives of the University of Chicago and the University of Wisconsin. The papers read in the symposium on the respiratory enzymes will be published separately by the University of Wisconsin. Appended to each paper is a magnificent bibliography, selected with care, covering the field in its most important aspects so far as vitamins are concerned.

Emergency Care

By Marie A. Wooders, R.N., Principal School of Nursing, Hackensack Hospital, and Donald Curtis, M.D., Lieutenant-Colonel, Medical Reserve, Commanding 342d Medical Regiment, U. S. Army, Instructor in Military Nursing, Hackensack Hospital, Hackensack, New Jersey. F. A. Davis Company, Philadelphia, 1942.

A nurses' manual for service in national and civil emergencies.

Demonstration of Physical Signs in Clinical Surgery

By Hamilton Bailey, F.R.C.S. (Eng.), Surgeon Royal Northern Hospital, London. Ed. 8. The Williams & Wilkins Company, Baltimore. 1942. Price, $7.

This book is of extraordinary value as it emphasizes the importance of a good history, physical methods of examination as being the main channels by which a diagnosis is made rather than the much used so-called aids to diagnosis on which far too much reliance is placed by the average practitioner. The text is based on demonstrations given to students, hence is clinical diagnosis par excellence—a Sherlock Holmes on the wards.

Castor Oil and Quinine

By George Wonson Vandergrift, M.D. E. P. Dutton & Co., Inc., New York. 1942. Price, $3.

This is a biography of the author's father who began the practice of medicine in 1879 down near Corlears Hook in New York's old seventh ward. His capital consisted of two dollars in cash, a little anatomy, less physiology, one drug—ipecac, and an invincible belief in the efficacy of castor oil and quinine. It is well written and delightful reading, full of humor, yet a good history of the practice of medicine in the eighties and nineties of the nineteenth century. Incidentally, it is a vivid picture of the growth and development of New York City.

War Medicine

Winfield Scott Pugh, M.D., Editor; Edward Podolsky, M.D., Associate Editor, and Dagobert D. Runes, Ph.D., Technical Editor. Philosophical Library, New York. 1942. Price, $7.50.

A symposium of fifty-seven papers on military surgery, aviation and naval medicine and general medicine of special interest to those who are serving with the armed forces of the United States in a medical capacity. Many of the papers are reprinted, with permission, from current medical literature. Gathered together in this volume brings much valuable material to the medical officer.

Advances in Internal Medicine

J. Murray Steele, M.D., Editor, Welfare Hospital, New York City. Interscience Publishers, Inc., New York. 1942. Price, $4.50.

A summary of progress in certain fields of medicine contributed by selected writers. Virtually a textbook on a variety of selected topics.

Clinics

A bimonthly, published by J. B. Lippincott Company, Philadelphia, under the editorship of Dr. George Morris Piersol, Professor of Medicine, Graduate School of Medicine, University of Pennsylvania, with the collaboration of sixteen distinguished clinicians. Price, $12 per year. Vol. I, No. I, June, 1942.

This is a revival of the former International Clinics but on a far more practical scale. Each volume will contain a symposium as well as original contributions and "clinics." The list of contributors to this first issue is an imposing one. They contribute 250 pages of the most authoritative information on a variety of subjects. The symposium considers "Burns and Shock."

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Microbiology and Man

By Jorgen Birkeland, Ph.D., Assistant Professor of Biology, Ohio State University. The Williams & Wilkins Company, Baltimore. 1942. Price, $4.

"Being an account of the diverse properties and characteristics of microorganisms, a description of the various tools and techniques for their handling, and an inquiry into their subtle relationships to everyday life." Thus sayeth the author in the subtitle to this book. For the most part the material is arranged in the conversational manner. The order in which the infectious diseases are taken up is based, in general, on the manner of transmission of the infectious agent and on the site of the disease rather than in accordance with the classification of the microorganism. The section on food, milk, water and sewage is placed last to give the student a fuller appreciation of the public health aspects of these diseases. Microorganisms are classified in the Appendix. A glossary contains much of value to the student.

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Starling's Principles of Human Physiology

Edited and revised by C. Lovatt Evans, F.R.C.P., Jodrell Professor of Physiology in University College, London. Ed. 8. Lea & Febiger, Philadelphia. 1942. Price, $10.

The text has been thoroughly revised and considerably enlarged. It now contains 138 pages more than its predecessor and has 119 more engravings. Many of the earlier illustrations have been discarded for more effective ones. The organization of the text has been radically changed to meet modern teaching requirements. The section on the Central Nervous System has been entirely rewritten and incorporates the results of some of the more important recent investigations. In the section dealing with reproduction, a large amount of new material has been added and the earlier text has been rearranged to suit more recent views. The material on the endocrine organs, on vitamins, on urinary secretion and those parts of physiology which are mainly biochemical has all been expanded and revised to reflect recent advances. Few pages of this work remain entirely unaltered since the last edition. References to current and classic literature are retained in the form of footnotes and in lists at the end of each section.

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A Textbook of Gynecology

By Arthur Hale Curtis, M.D., Professor and Chairman of the Department of Obstetrics and Gynecology, Northwestern University Medical School. Ed. 4. W. B. Saunders Company, Philadelphia. 1942. Price, $8.

A considerable part of this text has been rewritten to be in keeping with the knowledge of today and the author's vast experience as an operator and a teacher. It is elaborately and beautifully illustrated, hence has always been a good text for the student, both graduate and undergraduate. This book is deserving of the popularity it has always enjoyed.

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Aids to Physiology

By Henry Dryerre, Ph.D., M.R.C.S., F.R.S.E. Professor of Physiology, Royal Veterinary College. Edinburgh. Ed. 3. The Williams & Wilkins Company, Baltimore. 1942. Price, $1.50.

A good help for the student.

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Psychological Care During Infancy and Childhood

By Ruth M. Bakwin, M.D., Assistant Clinical Professor of Pediatrics, and Harry Bakwin, M.D., Associate Clinical Professor of Pediatrics, New York University College of Medicine. D. Appleton-Century Company, New York. 1942. Price, $3.50.

This book of 331 pages is primarily designed to instruct physicians in the promotion of optimal psychological health in the child. It is a very readable book and contains much valuable information on the child about which every physician should have cognizance.

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Solving School Health Problems:
The Astoria Demonstration Study, sponsored by the Department of Health and the Board of Education of New York City

By Dorothy B. Nyswander, Ph.D., Director of the Study. The Commonwealth Fund, New York. 1942. Price, $2.

The Principles of Anatomy As Seen in the Hand

By Frederic W. Jones, F.R.C.S., Professor of Anatomy, University of Manchester, England. Ed. 2. The Williams & Wilkins Company, Baltimore. 1942. Price, $7.50.

Stresses the importance of having a good knowledge of anatomy and tells more about the hand than one would deem possible. Not only good for anatomy, but also for general reading.

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Doctor Bard of Hyde Park: The Famous Physician of Revolutionary Times; the Man Who Saved George Washington's Life

By John Brett Langstaff. With Introduction by Nicholas Murray Butler. New York. E. P. Dutton & Co., Inc., New York City. 1942. Price, $3.75.

Little has been written of this distinguished eighteenth century physician. Yet he was one of the most important figures in post-revolutionary New York and his life was full of color and interest. He launched the first medical school in New York City—attached to King's College, later Columbia University—started New York Hospital, and saved George Washington's life, during the years when the Nation's Capitol was still in New York City—in 1789-1791, and his contacts led him into every activity of his time, social, cultural, and political.

His personal story is, therefore, the story of one of the stormiest periods in American history, and of a time of intellectual awakening in Great Britain. As a medical student in London and old Edinburgh under such pioneers as Hunter, Cullen and the Monros, Dr. Bard came also into intimate touch with Benjamin West and his circle. Later, in his medical and social life in New York City he was physician and friend to many outstanding figures, including Gen. Horatio Gates, Rufus King, Robert Livingston and both Hamilton and Burr; and Benjamin Franklin was an intimate of the Bard family. In short, his life was lived at the core of social and professional activity during the fabulous Federal years. One of the most important medical men of his time, he was also actively interested in every phase of social development, and the documents presented in this biography are bound to prove as exciting to students of the time as any which have recently come to light.

Dr. Bard's country seat was in Hyde Park, on a great tract of land which came to him through his mother from the original holder, the Huguenot, Peter Fauconnier, secretary to Edward Hyde, Viscount Cornbury, governor of New York in 1702. He was born in Philadelphia in 1742. He practiced medicine in New York, retired at the age of fifty-six and moved to his Hyde Park estate where he lived until his death in 1821 at the age of seventy-nine. . . . Well ahead of his time, he was for years the most important and active physician New York had. And he continued his activity throughout his life, even after retirement, as a prime mover in the organization of Medical and Agricultural Societies throughout the State and as President of the College of Physicians and Surgeons in New York City.

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Manual of Pharmacology: Its Applications to Therapeutics and Toxicology

By Torald Sollmann, M.D., Professor of Pharmacology and Materia Medica in the School of Medicine of Western Reserve University. Ed. 6. W. B. Saunders Company, Philadelphia. 1942. Price, $8.75.

Deservedly the most popular and most widely used teaching text for pharmacology.

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Diseases of the Nose, Throat and Ear

By I. Simson Hall, M. B., Surgeon to the Royal Infirmary, Edinburgh; Lecturer in the University of Edinburgh. Ed. 2. The Williams and Wilkins Company, Baltimore. 1942. Price, $4.50.

A very handy book for the student; small size; concise; well illustrated—and within reach of his pocketbook.

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The Management of the Sick Infant and Child

By Langley Porter, M.D., Dean Emeritus University of California Medical School and Professor of Medicine, and William E. Carter, M.D., Director of University of California Hospital Outpatient Department. Ed. 6. The C. V. Mosby Company, St. Louis. 1942. Price, $11.50.

Completely revised and brought into agreement with new knowledge in this field in the form of useful clinical advice as well as in technical procedures clearly described. The chapters on recipes and formulas and drugs should prove very valuable to the student as well as the practioner.

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Urology in War

By Charles Y. Bidgood, M.D., Lt. Comdr. (M.C.) U. S. Navy. The Williams & Wilkins Company, Baltimore. 1942. Price, $2.

Discusses the diagnosis and treatment of acute traumatic and inflammatory lesions of the genitourinary tract—designed especially for medical officers in the field, aboard ship or in isolated outposts who are not specialists in urology but may be forced to cope with such emergencies. An excellent book and very timely.

Motivation and Visual Factors: Individual Studies of College Students

By Irving E. Bender, Henry A. Imus and and John W. M. Rothney, Dartmouth College. Dartmouth College Publications, Hanover, N. H. 1942. Price, $4.

This is the definitive report on five years of investigation and study of members of the Dartmouth College class of 1940 following a preliminary report in *An Evaluation of Visual Factors in Reading* by Imus, Rothney and Bear, 1938.

The inquiry into visual factors in reading and academic accomplishment was extended to include a profound investigation of psychological factors which motivate the student.

To supplement the extensive data normally accumulated by Dartmouth College on its students in relation to academic accomplishment, scholastic aptitude, and health, many additional data were derived from visual measurements, psychological test scores and interviews covering their four years as undergraduates.

Correlations are based at some points on the entire class of 1940 numbering more than 500 members. Intensive individual studies were made of 124 members of the class. Of these, twenty were selected for further particular study and their psychoportraits constitute a substantial portion of the volume.

This report throws light on the important relation between motivational and visual factors at the college level and offers a developed scientific approach to further investigations of other groups.

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The Electrocardiogram and X-Ray Configuration of the Heart

By Arthur M. Master, M.D., Assistant Professor of Clinical Medicine, Columbia University. Ed. 2. Lea & Febiger, Philadelphia, 1942. Price, $7.50.

This revised edition represents an expansion of the text and the addition of numerous cases with illustrations. New sections have been added to include tricuspid valve disease, the giant left auricle, myxedema, diodrast visualization of the cardiac chambers, and acute diseases. A new grouping of the material has resulted in a more comprehensive consideration of electrocardiography and has clarified the presentation of the subject. The sections on valvular disease, congenital heart disease and pulmonary heart disease have been enlarged. Every phase of heart disease except therapy is now covered with emphasis on those which lend themselves to roentgenological diagnosis or interpretation. This is now a complete x-ray monograph on the heart and a compendium on the relation of the electrocardiogram to cardiac configuration.